Mathematics 1 - ADE/FyCo - 2020/2021
List of exercises 01-Functions for identity number: 113

Exercise 1

We have two bank accounts, the first in the bank A and the second in the bank B. In the bank A we obtain a continuous compound rate of 5% and in the bank B we are paid a compound interes rate of 9%. We initially deposit 11 000 euros in the bank A and 3000 in B. How long time is it necessary until the money in both accounts is exactly the same?

Remark: To obtain a correct answer it is necessary to work with at least 5 decimal digits.

1) In **2.***** years.

2) In **0.***** years.

3) In **1.***** years.

4) In **7.***** years.

5) In **5.***** years.

Exercise 2

We have one bank account that offers a continuous compound rate of 6% where we initially deposit 8000 euros. How long time is it necessary until the amount of money in the account reaches 11 000 euros?

Remark: To obtain a correct answer it is necessary to work with at least 5 decimal digits.

1) In **2.***** years.

2) In **4.***** years.

3) In **5.***** years.

4) In **0.***** years.

5) In **7.***** years.

Exercise 3

We have a bank account that initially offers a periodic compound interes rate of 10% in 5 periods (compounding frequency) , and after 1 year the conditions are modified and then we obtain a periodic compound interes rate of 1% in 9 periods (compounding frequency) . The initial deposit is 11 000 euros. Compute the amount of money in the account after 2 years from the moment of the first deposit.

1) We will have ****8.***** euros.

2) We will have ****2.***** euros.

3) We will have ****4.***** euros.

4) We will have ****6.***** euros.

5) We will have ****0.***** euros.

Exercise 4

A firm sells Q tons of certain product. The price received per ton is given by the formula P=20000−15Q. On the other hand, the production cost per ton is C=10000+6Q. In addition, the transportation cost is 8362 per ton. Compute the maximum profit that can be obtained selling this product.

1) Profit=31 941.

2) Profit=18 219.

3) Profit=21 063.

4) Profit=22 073.

5) Profit=30 247.

Exercise 5

Deposits in certain investment account vary from year to year alternating gains and looses periods. We have the following data about the deposits for different years:

year	deposits
2	13
4	31
5	43

By means of a interpolation polynomial, obtain the function that yields the deposits in the account for every year t. Employ that function to forecast the exact amount for year 6.

1) The depositis in the account for year 6 are −20.

2) The depositis in the account for year 6 are 1.

3) The depositis in the account for year 6 are 73.

4) The depositis in the account for year 6 are 19.

5) The depositis in the account for year 6 are 57.

Exercise 6

The funds of a public institution alternate periods of deficit and surplus. We have the following information for several years (in millions of euros):

year	funds
1	4
5	−44
9	−28

Employ an interpolation polynomial to build a function that yields the funds for each year t. We know that due to the legislation the funds of such an institution have to be kept between −44 and 4. Compute (by means of the polynomial obtained before by interpolation) the periods along which the funds are between the indicated limits inside the interval of time where we have information (that is to say, from t=1 to t=9).

1) The funds are inside the limits for the inverval: [7,9].

2) The funds are inside the limits for the inverval: [1,7].

3) The funds are inside the limits for the inverval: [1,5].

4) The funds are inside the limits for the inverval: [0,7].

5) The funds are inside the limits for the inverval: [0,1].

6) The funds are inside the limits for the intervals: [0,5] y [7,11].

7) The funds are inside the limits for the intervals: [1,5] y [7,9].

8) The funds are inside the limits for the inverval: [1,9].

Exercise 7

The population of a city is studied between years t=3 and t=8. In that period the population is given by the function $P(t)=3+336\,t-66\,t^2+4\,t^3$. Determine the intervals of years when the population is between 507 and 533.

1) Along the interval of years: [7.40655,8.].

2) Along the interval of years: [4.70111,8.76984].

3) Along the interval of years: [6.,7.].

4) Along the intervals of years: [3,3], [3.18826,5], [6,7.81174] and [8,8].

5) Along the interval of years: [5.5138,6.].

6) Along the interval of years: [3.,8.].

7) Along the interval of years: [7.,8.].

8) Along the intervals of years: [3,3.18826], [5,6] and [7.81174,8].

Exercise 8

Compute the limit: $\lim_{x\to-\infty} 3+7x+7x^2-7x^3$

1) -2

2) -7

3) $-\infty$

4) 1

5) ∞

6) -6

7) 0

Exercise 9

The population of certain country (in millions of habitants) is given by the function $P(t) = 28\left(\frac{-7+3t-t^2-7t^3}{-3-6t+2t^2-7t^3}\right)^{-4-6t+t^2}$. Determine the future tendency for this population.

1) $\frac{28}{e^5}$

2) $\frac{28}{e^2}$

3) ∞

4) 0

5) $\frac{28}{e^4}$

6) $-\infty$

7) 28

Exercise 10

We deposit 15000 euros in a bank account with a continuous compound rate of 10%. At the same time every year we also add in a safe-deposit box (therefore with no interest rate) 5000 euros. How long time is it necessary until the total ammount of money (jointly in the bank account and safe-depsit box) is 40000 euros? (the solution can be found for t between 3 and 8).

1) t=**.0****

2) t=**.2****

3) t=**.4****

4) t=**.6****

5) t=**.8****

Exercise 11

Study the continuity of the function $f(x) = \begin{cases} \sin(3-x) + 2\cos(3-x) & x \le 3 \\ -2\sin(3-x) - \cos(3-x) + 3 & 3 < x < 6 \\ 3\sin(6-x) - 2\,e^{x-6} & 6 \le x \end{cases}$

1) The functions is continuous for all points.

2) The functions is not continuous at any point.

3) The function is continuous for all the points except for x=3.

4) The function is continuous for all the points except for x=6.

5) The function is continuous for all the points except for x=3 and x=6.

Mathematics 1 - ADE/FyCo - 2020/2021
List of exercises 01-Functions for identity number: 4501

Exercise 1

We have two bank accounts, the first in the bank A and the second in the bank B. In the bank A we obtain a compound interes rate of 6% and in the bank B we are paid a periodic compound interes rate of 3% in 4 periods (compounding frequency). We initially deposit 4000 euros in the bank A and 14 000 in B. How long time is it necessary until the money in both accounts is exactly the same?

Remark: To obtain a correct answer it is necessary to work with at least 5 decimal digits.

1) In **8.***** years.

2) In **1.***** years.

3) In **9.***** years.

4) In **0.***** years.

5) In **4.***** years.

Exercise 2

Certain parcel of land is revalued from an initial value of 187 000 euros until a final value of 381 000 euros along 5 years. Determine the rate of compound interes for that revaluation.

Remark: To obtain a correct answer it is necessary to work with at least 5 decimal digits.

1) The interest rate is **2.*****%.

2) The interest rate is **3.*****%.

3) The interest rate is **5.*****%.

4) The interest rate is **1.*****%.

5) The interest rate is **9.*****%.

Exercise 3

We have a bank account that initially offers a compound interes rate of 6%, and after 2 years the conditions are modified and then we obtain a periodic compound interes rate of 4% in 4 periods (compounding frequency). The initial deposit is 14 000 euros. Compute the amount of money in the account after 10 years from the moment of the first deposit.

1) We will have ****9.***** euros.

2) We will have ****3.***** euros.

3) We will have ****1.***** euros.

4) We will have ****8.***** euros.

5) We will have ****0.***** euros.

Exercise 4

A firm sells Q tons of certain product. The price received per ton is given by the formula P=11000−20Q. On the other hand, the production cost per ton is C=2000+8Q. In addition, the transportation cost is 8104 per ton. Compute the maximum profit that can be obtained selling this product.

1) Profit=2656.

2) Profit=9823.

3) Profit=7168.

4) Profit=5350.

5) Profit=8481.

Exercise 5

Deposits in certain investment account vary from year to year alternating gains and looses periods. We have the following data about the deposits for different years:

year	deposits
0	9
2	89
4	153

By means of a interpolation polynomial, obtain the function that yields the deposits in the account for every year t. Employ that function to determine the maximum funds available in the investment account.

1) The maximum for the depositis in the account was 7.

2) The maximum for the depositis in the account was 251.

3) The maximum for the depositis in the account was 8.

4) The maximum for the depositis in the account was 11.

5) The maximum for the depositis in the account was 201.

Exercise 6

The funds of a public institution alternate periods of deficit and surplus. We have the following information for several years (in millions of euros):

year	funds
2	1
5	-8
8	1

Employ an interpolation polynomial to build a function that yields the funds for each year t. We know that due to the legislation the funds of such an institution have to be kept between -10 and -7. Compute (by means of the polynomial obtained before by interpolation) the periods along which the funds are between the indicated limits inside the interval of time where we have information (that is to say, from t=2 to t=8).

1) The funds are inside the limits for the inverval: [-2,9].

2) The funds are inside the limits for the inverval: [-2,3].

3) The funds are inside the limits for the inverval: [4,6].

4) The funds are inside the limits for the inverval: [6,8].

5) The funds are inside the limits for the inverval: [0,8].

6) The funds are inside the limits for the inverval: [8,8].

7) The funds are inside the limits for the inverval: [0,6].

8) The funds are inside the limits for the inverval: [4,8].

Exercise 7

The population of a city is studied between years t=4 and t=9. In that period the population is given by the function $P(t)=8+576t-84t^2+4t^3$. Determine the intervals of years when the population is between 1224 and 1368.

1) Along the interval of years: [5.,7.53869].

2) Along the interval of years: [5.76281,9.].

3) Along the intervals of years: [6.,7.66518] and [8.72405,9.57329].

4) Along the intervals of years: [4,4] and [9,9].

5) Along the interval of years: [4,9].

6) Along the interval of years: [4.00876,8.40605].

7) Along the intervals of years: [4.56769,5.20076] and [7.56041,8.].

8) Along the interval of years: [4.,7.].

Exercise 8

Compute the limit: $\lim_{x\to-\infty}\left(\frac{5+x-9x^2}{9+8x-9x^2}\right)^{-7+x+6x^2}$

1) $\frac{1}{e^3}$

2) $\frac{1}{e^4}$

3) $-\infty$

4) ∞

5) $\frac{1}{e^2}$

6) 0

7) 1

Exercise 9

The population of certain country (in millions of habitants) is given by the function $P(t) = 40\left(\frac{-5-8t-8t^2+6t^3}{-6-7t+9t^2+6t^3}\right)^{2+2t}$. Determine the future tendency for this population.

1) ∞

2) $\frac{40}{e^{17/3}}$

3) $\frac{40}{e^{1417/250}}$

4) $\frac{40}{e^3}$

5) 40

6) $-\infty$

7) 0

Exercise 10

The population in certain turistic area increases exponentially and is given by the function $P(t) = 60000\, e^{t/50}$ that indicates the number of resident citizens for every year t. At the same time, depending on the season, the city receives a variable number of tourists given by the trigonometric function $I(t) = 5000 + 1000 \operatorname{Sin}\left[\frac{t}{2\pi}\right]$ that yields the amount of visitors in the area for every moment t (t in years). Determine how many years are necessary until the total nomber of habitants is 97000. (the solution can be found for t between 20 and 25).

1) t=**.1****

2) t=**.3****

3) t=**.5****

4) t=**.7****

5) t=**.9****

Exercise 11

Study the continuity of the function $f(x)=\begin{cases} -2\,e^{x+2}-\sin(x+2) & x\le -2 \\ 4x+4 & -2<x<-1 \\ -2\sin(x+1) & -1\le x \end{cases}$

1) The functions is continuous for all points.

2) The functions is not continuous at any point.

3) The function is continuous for all the points except for $x=-2$.

4) The function is continuous for all the points except for $x=-1$.

5) The function is continuous for all the points except for $x=-2$ and $x=-1$.

Mathematics 1 - ADE/FyCo - 2020/2021
List of exercises 01-Functions for identity number: 187462

Exercise 1

We have two bank accounts, the first in the bank A and the second in the bank B. In the bank A we obtain a compound interes rate of 9% and in the bank B we are paid a periodic compound interes rate of 6% in 6 periods (compounding frequency). We initially deposit 1000 euros in the bank A and 7000 in B. How long time is it necessary until the money in both accounts is exactly the same?

Remark: To obtain a correct answer it is necessary to work with at least 5 decimal digits.

1) In **9.***** years.

2) In **3.***** years.

3) In **2.***** years.

4) In **5.***** years.

5) In **0.***** years.

Exercise 2

We have one bank account that offers a compound interes rate of 4% where we initially deposit 10 000 euros. How long time is it necessary until the amount of money in the account reaches 16 000 euros?

Remark: To obtain a correct answer it is necessary to work with at least 5 decimal digits.

1) In **0.***** years.

2) In **6.***** years.

3) In **9.***** years.

4) In **5.***** years.

5) In **1.***** years.

Exercise 3

We have a bank account that initially offers a periodic compound interes rate of 9% in 6 periods (compounding frequency), and after 1 year the conditions are modified and then we obtain a periodic compound interes rate of 6% in 8 periods (compounding frequency). The initial deposit is 7000 euros. Compute the amount of money in the account after 10 years from the moment of the first deposit.

1) We will have ****9.***** euros.

2) We will have ****2.***** euros.

3) We will have ****0.***** euros.

4) We will have ****8.***** euros.

5) We will have ****5.***** euros.

Exercise 4

A firm sells Q tons of certain product. The price received per ton is given by the formula P=3000-7Q. On the other hand, the production cost per ton is C=1000+6Q. In addition, the transportation cost is 1792 per ton. Compute the maximum profit that can be obtained selling this product.

1) Profit=1115.

2) Profit=1336.

3) Profit=1157.

4) Profit=452.

5) Profit=832.

Exercise 5

Deposits in certain investment account vary from year to year alternating gains and looses periods. We have the following data about the deposits for different years:

year	deposits
0	3
1	4
2	9

By means of a interpolation polynomial, obtain the function that yields the deposits in the account for every year t. Employ that function to forecast the exact amount for year 4.

1) The depositis in the account for year 4 are 6.

2) The depositis in the account for year 4 are 48.

3) The depositis in the account for year 4 are 18.

4) The depositis in the account for year 4 are 1.

5) The depositis in the account for year 4 are 31.

Exercise 6

The funds of a public institution alternate periods of deficit and surplus.
We have the following information for several years (in millions of euros):

year	funds
0	18
4	34
8	18

Employ an interpolation polynomial to build a function that yields the funds for each year t. We know that due to the legislation the funds of such an institution have to be kept between 30 and 33 . Compute (by means of the polynomial obtained before by interpolation) the periods along which the funds are between the indicated limits inside the interval of time where we have information (that is to say, from t=0 to t=8).

1) The funds are inside the limits for the inverval: [3,6].

2) The funds are inside the limits for the inverval: [6,8].

3) The funds are inside the limits for the inverval: [0,3].

4) The funds are inside the limits for the inverval: [3,8].

5) The funds are inside the limits for the inverval: [0,6].

6) The funds are inside the limits for the intervals: [2,3] y [5,6].

7) The funds are inside the limits for the inverval: [2,3].

8) The funds are inside the limits for the intervals: [0,2] y [5,6].

Exercise 7

Se realiza un estudio para analizar la población de cierto tipo de roedores en una comarca entre los años t=1 y t=8. En ese período la población viene dada por la función $P(t) = 7 + 288\,t - 60\,t^2 + 4\,t^3$ (en miles de roedores). Determinar durante qué años el número de miles de roedores se sitúa entre 455 y 655.

1) Along the intervals of years: [2.20628,5.] and [6.,8.79968].

2) Along the interval of years: [7,8].

3) Along the intervals of years: [4,4] and [7,8].

4) Along the intervals of years: [2.,4.] and [6.,7.].

5) Along the interval of years: [6.47986,7.].

6) Along the interval of years: [4.,5.30981].

7) Along the intervals of years: [1.57313,2.] and [5.,8.].

8) Along the intervals of years: [1,7] and [8,8].

Exercise 8

Compute the limit: $\lim_{x\to\infty}\left(\frac{7-3x+6x^2}{8-3x+6x^2}\right)^{-2+2x}$

1) ∞

2) $-\infty$

3) $\frac{1}{e^5}$

4) $\frac{1}{e^4}$

5) $\frac{1}{e^3}$

6) 1

7) 0

Exercise 9

From an initial deposit 12000, the interest rate varies every year in such a way that the total amount of money in the account is given by the function $C(t) = 12\,000\left(\frac{-7+8t-5t^2-3t^3}{-2+t-7t^2-3t^3}\right)^{-1+2t}$. Determine the future tendency for the deposits that we will have after a large number of years.

1) $\frac{12\,000}{e^{267/200}}$

2) $\frac{12\,000}{e^5}$

3) $-\infty$

4) ∞

5) 12 000

6) 0

7) $\frac{12\,000}{e^{4/3}}$

Exercise 10

We deposit 11000 euros in a bank account with a continuous compound rate of 2%. At the same time every year we also add in a safe-deposit box (therefore with no interest rate) 2000 euros. How long time is it necessary until the total ammount of money (jointly in the bank account and safe-depsit box) is 34000 euros? (the solution can be found for t between 8 and 13).

1) t=**.0****

2) t=**.2****

3) t=**.4****

4) t=**.6****

5) t=**.8****

Exercise 11

Study the continuity of the function $f(x) = \begin{cases} -3\sin(x+1) - 2\cos(x+1) & x \le -1 \\ x - 1 & -1 < x < 0 \\ -1 & 0 \le x \end{cases}$

1) The functions is continuous for all points.

2) The functions is not continuous at any point.

3) The function is continuous for all the points except for $x=-1$.

4) The function is continuous for all the points except for $x=0$.

5) The function is continuous for all the points except for $x=-1$ and $x=0$.

Mathematics 1 - ADE/FyCo - 2020/2021
List of exercises 01-Functions for identity number: 550273

Exercise 1

We have two bank accounts, the first in the bank A and the second in the bank B. In the bank A we obtain a compound interes rate of 6% and in the bank B we are paid a periodic compound interes rate of 3% in 12 periods (compounding frequency). We initially deposit 4000 euros in the bank A and 8000 in B. How long time is it necessary until the money in both accounts is exactly the same?

Remark: To obtain a correct answer it is necessary to work with at least 5 decimal digits.

1) In **6.***** years.

2) In **0.***** years.

3) In **7.***** years.

4) In **1.***** years.

5) In **4.***** years.

Exercise 2

We have one bank account that offers a periodic compound interes rate of 6% in 11 periods (compounding frequency) where we initially deposit 12 000 euros. How long time is it necessary until the amount of money in the account reaches 18 000 euros?

Remark: To obtain a correct answer it is necessary to work with at least 5 decimal digits.

1) In **0.***** years.

2) In **7.***** years.

3) In **5.***** years.

4) In **6.***** years.

5) In **3.***** years.

Exercise 3

We have a bank account that initially offers a continuous compound rate of 2%, and after 4 years the conditions are modified and then we obtain a periodic compound interes rate of 1% in 7 periods (compounding frequency). The initial deposit is 8000 euros. Compute the amount of money in the account after 6 years from the moment of the first deposit.

1) We will have ****6.***** euros.

2) We will have ****9.***** euros.

3) We will have ****5.***** euros.

4) We will have ****1.***** euros.

5) We will have ****3.***** euros.

Exercise 4

A firm sells Q tons of certain product. The price received per ton is given by the formula P=13000-9Q. On the other hand, the production cost per ton is C=10000-7Q. In addition, the transportation cost is 2800 per ton. Compute the maximum profit that can be obtained selling this product.

1) Profit=7936.

2) Profit=2312.

3) Profit=6892.

4) Profit=4256.

5) Profit=5000.

Exercise 5

Deposits in certain investment account vary from year to year alternating gains and looses periods. We have the following data about the deposits for different years:

year	deposits
0	3
1	2
3	-6

By means of a interpolation polynomial, obtain the function that yields the deposits in the account for every year t. Employ that function to forecast the exact amount for year 5.

1) The depositis in the account for year 5 are 7.

2) The depositis in the account for year 5 are 0.

3) The depositis in the account for year 5 are -22.

4) The depositis in the account for year 5 are -33.

5) The depositis in the account for year 5 are 2.

Exercise 6

The funds of a public institution alternate periods of deficit and surplus. We have the following information for several years (in millions of euros):

year	funds
0	24
4	120
8	120

Employ an interpolation polynomial to build a function that yields the funds for each year t. We know that due to the legislation the funds of such an institution have to be kept between 19 and 129 . Compute (by means of the polynomial obtained before by interpolation) the periods along which the funds are between the indicated limits inside the interval of time where we have information (that is to say, from t=0 to t=8).

1) The funds are inside the limits for the inverval: [-2,8].

2) The funds are inside the limits for the intervals: [0,5] y [7,8].

3) The funds are inside the limits for the inverval: [5,8].

4) The funds are inside the limits for the inverval: [0,7].

5) The funds are inside the limits for the inverval: [7,8].

6) The funds are inside the limits for the inverval: [0,8].

7) The funds are inside the limits for the inverval: [-2,9].

8) The funds are inside the limits for the inverval: [8,8].

Exercise 7

Se realiza un estudio para analizar la población de cierto tipo de roedores en una comarca entre los años t=1 y t=10. En ese período la población viene dada por la función $P(t) = 6 + 672\,t - 90\,t^2 + 4\,t^3$ (en miles de roedores). Determinar durante qué años el número de miles de roedores se sitúa entre 1320 y 1662.

1) Along the intervals of years: [1.,3.59406] and [7.49748,8.56751].

2) Along the interval of years: [4.24739,8.3].

3) Along the intervals of years: [1.39345,2.] and [7.47882,8.15906].

4) Along the intervals of years: [1.68897,3.] and [9.12082,10.].

5) Along the interval of years: [1.,9.75618].

6) Along the intervals of years: [1,3] and [6,10].

7) Along the interval of years: [3,6].

8) Along the intervals of years: [1.,5.] and [7.16749,10.3672].

Exercise 8

Compute the limit: $\lim_{x\to\infty} \frac{5-9x+7x^2-3x^3}{-2-7x-9x^2-8x^3}$

1) -1

2) 0

3) ∞

4) $\frac{3}{8}$

5) 1

6) $-\infty$

7) $-\frac{2}{3}$

Exercise 9

From an initial deposit 12000, the interest rate varies every year in such a way that the total amount of money in the account is given by the function $C(t) = 12\,000 \left(\frac{-1-7t+9t^2-4t^3}{7-2t-t^2-4t^3}\right)^{5+8t+4t^2}$. Determine the future tendency for the deposits that we will have after a large number of years.

1) $\frac{12\,000}{e^2}$

2) $\frac{12\,000}{e}$

3) $\frac{12\,000}{e^3}$

4) $12\,000$

5) ∞

6) $-\infty$

7) 0

Exercise 10

We deposit 16000 euros in a bank account with a continuous compound rate of 7%. At the same time every year we also add in a safe-deposit box (therefore with no interest rate) 2000 euros. How long time is it necessary until the total ammount of money (jointly in the bank account and safe-depsit box) is 65000 euros? (the solution can be found for t between 9 and 14).

1) t=**.0****

2) t=**.2****

3) t=**.4****

4) t=**.6****

5) t=**.8****

Exercise 11

Study the continuity of the function $f(x) = \begin{cases} 3\sin(x) & x \le 0 \\ 3\log(x+1) & 0 < x < 2 \\ \cos(2-x) - 2\sin(2-x) & 2 \le x \end{cases}$

1) The functions is continuous for all points.

2) The functions is not continuous at any point.

3) The function is continuous for all the points except for x=0.

4) The function is continuous for all the points except for x=2.

5) The function is continuous for all the points except for x=0 and x=2.

Mathematics 1 - ADE/FyCo - 2020/2021
List of exercises 01-Functions for identity number: 2959749

Exercise 1

We have two bank accounts, the first in the bank A and the second in the bank B. In the bank A we obtain a compound interes rate of 6% and in the bank B we are paid a periodic compound interes rate of 10% in 2 periods (compounding frequency). We initially deposit 5000 euros in the bank A and 1000 in B. How long time is it necessary until the money in both accounts is exactly the same?

Remark: To obtain a correct answer it is necessary to work with at least 5 decimal digits.

1) In **7.***** years.

2) In **0.***** years.

3) In **6.***** years.

4) In **1.***** years.

5) In **8.***** years.

Exercise 2

Certain parcel of land is revalued from an initial value of 223 000 euros until a final value of 483 000 euros along 6 years. Determine the rate of continuous compound interes for that revaluation.

Remark: To obtain a correct answer it is necessary to work with at least 5 decimal digits.

1) The interest rate is **2.*****%.

2) The interest rate is **4.*****%.

3) The interest rate is **6.*****%.

4) The interest rate is **8.*****%.

5) The interest rate is **7.*****%.

Exercise 3

We have a bank account that initially offers a periodic compound interes rate of 7% in 12 periods (compounding frequency), and after 1 year the conditions are modified and then we obtain a compound interes rate of 8%. The initial deposit is 5000 euros. Compute the amount of money in the account after 3 years from the moment of the first deposit.

1) We will have ****3.***** euros.

2) We will have ****0.***** euros.

3) We will have ****4.***** euros.

4) We will have ****9.***** euros.

5) We will have ****7.***** euros.

Exercise 4

A firm sells Q tons of certain product. The price received per ton is given by the formula P=4000-9Q. On the other hand, the production cost per ton is C=2000-3Q. In addition, the transportation cost is 1676 per ton. Compute the maximum profit that can be obtained selling this product.

1) Profit=4374.

2) Profit=3777.

3) Profit=7094.

4) Profit=1370.

5) Profit=2787.

Exercise 5

Deposits in certain investment account vary from year to year alternating gains and looses periods. We have the following data about the deposits for different years:

year	deposits
2	100
4	52
6	20

By means of a interpolation polynomial, obtain the function that yields the deposits in the account for every year t. Employ that function to determine the minimum funds available in the investment account.

1) The minimum for the depositis in the account was -9.

2) The minimum for the depositis in the account was 9.

3) The minimum for the depositis in the account was 2.

4) The minimum for the depositis in the account was 17.

5) The minimum for the depositis in the account was 4.

Exercise 6

The funds of a public institution alternate periods of deficit and surplus. We have the following information for several years (in millions of euros):

year	funds
0	0
2	18
5	90

Employ an interpolation polynomial to build a function that yields the funds for each year t. We know that due to the legislation the funds of such an institution have to be kept between 6 and 60. Compute (by means of the polynomial obtained before by interpolation) the periods along which the funds are between the indicated limits inside the interval of time where we have information (that is to say, from t=0 to t=5).

1) The funds are inside the limits for the inverval: [-5,-2].

2) The funds are inside the limits for the inverval: [0,1].

3) The funds are inside the limits for the inverval: [-5,0].

4) The funds are inside the limits for the inverval: [1,5].

5) The funds are inside the limits for the intervals: [-5,-2] y [4,5].

6) The funds are inside the limits for the inverval: [-5,1].

7) The funds are inside the limits for the inverval: [1,4].

8) The funds are inside the limits for the inverval: [-5,5].

Exercise 7

The deposits in certain account between the months t=0 and t=10 is given by the function $C(t)=9+96t-54t^2+4t^3$. Determine the months for which the deposit is between -593 and 17 euros.

1) Along the intervals of months: [0,0.0876242], [2,7] and [8.91238,10].

2) Along the intervals of months: [1.,4.2037] and [6.,7.].

3) Along the interval of months: [4.66694,5.51279].

4) Along the interval of months: [0.792927,8.0825].

5) Along the intervals of months: [0.484666,2.] and [8.,9.].

6) Along the intervals of months: [1.,3.] and [6.,10.3553].

7) Along the intervals of months: [0,0], [0.0876242,2], [7,8.91238] and [10,10].

8) Along the interval of months: [6.49679,10.].

Exercise 8

Compute the limit: $\lim_{x\to-\infty} 8 - 5x + 2x^2 - 7x^3 + 7x^4 - 4x^5$

1) -8

2) ∞

3) -7

4) $-\infty$

5) 1

6) 0

7) -9

Exercise 9

From an initial deposit 11000, the interest rate varies every year in such a way that the total amount of money in the account is given by the function $C(t) = 11\,000 \left(\frac{4 - 7t - 4t^2 - 5t^3}{7 + 5t - 3t^2 - 5t^3}\right)^{3+9t}$. Determine the future tendency for the deposits that we will have after a large number of years.

1) $11\,000$

2) $\frac{11\,000}{e^5}$

3) $11\,000\, e^{9/5}$

4) ∞

5) 0

6) $\frac{11\,000}{e^4}$

7) $-\infty$

Exercise 10

The population in certain turistic area increases exponentially and is given by the function $P(t) = 83\,000\, e^{t/50}$ that indicates the number of resident citizens for every year t. At the same time, depending on the season, the city receives a variable number of tourists given by the trigonometric function $I(t) = 5000 + 2000 \operatorname{Sin}\left[\frac{t}{2\pi}\right]$ that yields the amount of visitors in the area for every moment t (t in years). Determine how many years are necessary until the total nomber of habitants is 127000. (the solution can be found for t between 17 and 22).

1) t=**.1****

2) t=**.3****

3) t=**.5****

4) t=**.7****

5) t=**.9****

Exercise 11

Study the continuity of the function $f(x) = \begin{cases} e^{x-1} + 2\sin(1-x) & x \le 1 \\ 1 - 3\log(x) & 1 < x < 3 \\ -\sin(3-x) - 2\cos(3-x) & 3 \le x \end{cases}$

1) The functions is continuous for all points.

2) The functions is not continuous at any point.

3) The function is continuous for all the points except for x=1.

4) The function is continuous for all the points except for x=3.

5) The function is continuous for all the points except for x=1 and x=3.

Mathematics 1 - ADE/FyCo - 2020/2021
List of exercises 01-Functions for identity number: 3180328

Exercise 1

We have two bank accounts, the first in the bank A and the second in the bank B. In the bank A we obtain a periodic compound interes rate of 4% in 9 periods (compounding frequency) and in the bank B we are paid a periodic compound interes rate of 10% in 10 periods (compounding frequency). We initially deposit 10000 euros in the bank A and 5000 in B. How long time is it necessary until the money in both accounts is exactly the same?

Remark: To obtain a correct answer it is necessary to work with at least 5 decimal digits.

1) In **3.***** years.

2) In **7.***** years.

3) In **5.***** years.

4) In **1.***** years.

5) In **0.***** years.

Exercise 2

Certain parcel of land is devalued from an initial value of 441000 euros until a final value of 325000 euros along 7 years. Determine the rate of periodic compound interes in 10 periods for that devaluation.

Remark: To obtain a correct answer it is necessary to work with at least 5 decimal digits.

1) The interest rate is **3.*****%.

2) The interest rate is **8.*****%.

3) The interest rate is **4.*****%.

4) The interest rate is **0.*****%.

5) The interest rate is **9.*****%.

Exercise 3

We have a bank account that initially offers a continuous compound rate of 8%, and after 3 years the conditions are modified and then we obtain a continuous compound rate of 7%. The initial deposit is 10000 euros. Compute the amount of money in the account after 8 years from the moment of the first deposit.

1) We will have ****5.***** euros.

2) We will have ****7.***** euros.

3) We will have ****8.***** euros.

4) We will have ****9.***** euros.

5) We will have ****4.***** euros.

Exercise 4

A firm sells Q tons of certain product. The price received per ton is given by the formula P=7000-13Q. On the other hand, the production cost per ton is C=3000-2Q. In addition, the transportation cost is 3032 per ton. Compute the maximum profit that can be obtained selling this product.

1) Profit=7303.

2) Profit=19 368.

3) Profit=22 880.

4) Profit=32 074.

5) Profit=21 296.

Exercise 5

Deposits in certain investment account vary from year to year alternating gains and looses periods. We have the following data about the deposits for different years:

year	deposits
1	106
2	87
3	70

By means of a interpolation polynomial, obtain the function that yields the deposits in the account for every year t. Employ that function to determine the minimum funds available in the investment account.

1) The minimum for the depositis in the account was 31.

2) The minimum for the depositis in the account was 6.

3) The minimum for the depositis in the account was 14.

4) The minimum for the depositis in the account was 11.

5) The minimum for the depositis in the account was 16.

Exercise 6

The funds of a public institution alternate periods of deficit and surplus.
We have the following information for several years (in millions of euros):

year	funds
1	48
4	93
7	84

Employ an interpolation polynomial to build a function that yields the funds for each year t. We know that due to the legislation the funds of such an institution have to be kept between 69 and 84. Compute (by means of the polynomial obtained before by interpolation) the periods along which the funds are between the indicated limits inside the interval of time where we have information (that is to say, from t=1 to t=7).

1) The funds are inside the limits for the inverval: [7,8].

2) The funds are inside the limits for the intervals: [2,3] y [7,7].

3) The funds are inside the limits for the inverval: [0,8].

4) The funds are inside the limits for the inverval: [3,7].

5) The funds are inside the limits for the inverval: [0,3].

6) The funds are inside the limits for the inverval: [2,3].

7) The funds are inside the limits for the inverval: [3,8].

8) The funds are inside the limits for the intervals: [0,2] y [7,8].

Exercise 7

The population of a city is studied between years t=2 and t=10. In that period the population is given by the function $P(t)=4+336\,t-66\,t^2+4\,t^3$. Determine the intervals of years when the population is between 508 and 534.

1) Along the intervals of years: [2.16552,3.] and [6.20156,10.].

2) Along the intervals of years: [2.68826,3.18826], [5,6] and [7.81174,8.31174].

3) Along the intervals of years: [2,2.68826], [3.18826,5], [6,7.81174] and [8.31174,10].

4) Along the intervals of years: [3.,6.05054] and [8.,9.].

5) Along the intervals of years: [2.,3.41794] and [4.,7.13041].

6) Along the intervals of years: [4.11754,7.] and [9.,10.356].

7) Along the intervals of years: [2.07786,4.] and [5.00817,9.].

8) Along the intervals of years: [2.5291,6.] and [7.13432,9.].

Exercise 8

Compute the limit: $\lim_{x\to-\infty}\left(\frac{6-3x-5x^2+6x^3}{-2+5x+2x^2+6x^3}\right)^{-2+x}$

1) ∞

2) 0

3) $-\infty$

4) $\frac{1}{e^{7/6}}$

5) 1

6) $\frac{1}{e^5}$

7) $\frac{1}{e^4}$

Exercise 9

A factory produces certain type of devices. The marginal cost (cost of producing one unit) decreases when we produce a large amount of units and it is given by the function $C(x)=\frac{3+9x+6x^2+4x^3+3x^4}{8+8x+6x^2+5x^3+x^4}$. Determine the expected cost per unit when a large amount of units is produced.

1) $\frac{76}{25}$

2) 0

3) $-\infty$

4) 16 000

5) ∞

6) $-\frac{3}{2}$

7) 3

Exercise 10

The population in certain turistic area increases exponentially and is given by the function $P(t)=92\,000\, e^{t/50}$ that indicates the number of resident citizens for every year t. At the same time, depending on the season, the city receives a variable number of tourists given by the trigonometric function $I(t)=3000+2000\,\mathrm{Sin}\left[\frac{t}{2\pi}\right]$ that yields the amount of visitors in the area for every moment t (t in years). Determine how many years are necessary until the total nomber of habitants is 144000. (the solution can be found for t between 20 and 25).

1) t=**.1****

2) t=**.3****

3) t=**.5****

4) t=**.7****

5) t=**.9****

Exercise 11

Study the continuity of the function $f(x)=\begin{cases} \sin(2-x) & x \le 2 \\ \frac{x}{3}-\frac{2}{3} & 2 < x < 5 \\ e^{x-5}-2\sin(5-x) & 5 \le x \end{cases}$

1) The functions is continuous for all points.

2) The functions is not continuous at any point.

3) The function is continuous for all the points except for x=2.

4) The function is continuous for all the points except for x=5.

5) The function is continuous for all the points except for x=2 and x=5.

Mathematics 1 - ADE/FyCo - 2020/2021
List of exercises 01-Functions for identity number: 6548030

Exercise 1

We have two bank accounts, the first in the bank A and the second in the bank B. In the bank A we obtain a periodic compound interes rate of 6% in 9 periods (compounding frequency) and in the bank B we are paid a compound interes rate of 3% . We initially deposit 1000 euros in the bank A and 6000 in B. How long time is it necessary until the money in both accounts is exactly the same?

Remark: To obtain a correct answer it is necessary to work with at least 5 decimal digits.

1) In **1.***** years.

2) In **6.***** years.

3) In **0.***** years.

4) In **9.***** years.

5) In **5.***** years.

Exercise 2

Certain parcel of land is revalued from an initial value of 112 000 euros until a final value of 385 000 euros along 8 years. Determine the rate of compound interes for that revaluation.

Remark: To obtain a correct answer it is necessary to work with at least 5 decimal digits.

1) The interest rate is **7.*****%.

2) The interest rate is **9.*****%.

3) The interest rate is **1.*****%.

4) The interest rate is **6.*****%.

5) The interest rate is **0.*****%.

Exercise 3

We have a bank account that initially offers a compound interes rate of 5%, and after 2 years the conditions are modified and then we obtain a compound interes rate of 7% . The initial deposit is 6000 euros. Compute the amount of money in the account after 10 years from the moment of the first deposit.

1) We will have ****4.***** euros.

2) We will have ****7.***** euros.

3) We will have ****5.***** euros.

4) We will have ****3.***** euros.

5) We will have ****2.***** euros.

Exercise 4

A firm sells Q tons of certain product. The price received per ton is given by the formula P=110000−7Q. On the other hand, the production cost per ton is C=40000+20Q. In addition, the transportation cost is 67300 per ton. Compute the maximum profit that can be obtained selling this product.

1) Profit=41 986.

2) Profit=82 842.

3) Profit=80 410.

4) Profit=104 649.

5) Profit=67 500.

Exercise 5

Deposits in certain investment account vary from year to year alternating gains and looses periods. We have the following data about the deposits for different years:

year	deposits
0	167
1	133
2	103

By means of a interpolation polynomial, obtain the function that yields the deposits in the account for every year t. Employ that function to determine the minimum funds available in the investment account.

1) The minimum for the depositis in the account was 12.

2) The minimum for the depositis in the account was −7.

3) The minimum for the depositis in the account was 5.

4) The minimum for the depositis in the account was 37.

5) The minimum for the depositis in the account was 9.

Exercise 6

The funds of a public institution alternate periods of deficit and surplus. We have the following information for several years (in millions of euros):

year	funds
0	25
3	28
6	13

Employ an interpolation polynomial to build a function that yields the funds for each year t. We know that due to the legislation the funds of such an institution have to be kept between 13 and 20 . Compute (by means of the polynomial obtained before by interpolation) the periods along which the funds are between the indicated limits inside the interval of time where we have information (that is to say, from t=0 to t=6).

1) The funds are inside the limits for the inverval: [-2,4].

2) The funds are inside the limits for the inverval: [0,6].

3) The funds are inside the limits for the inverval: [-1,7].

4) The funds are inside the limits for the inverval: [-2,3].

5) The funds are inside the limits for the inverval: [5,6].

6) The funds are inside the limits for the inverval: [6,6].

7) The funds are inside the limits for the inverval: [-1,6].

8) The funds are inside the limits for the inverval: [0,5].

Exercise 7

Se realiza un estudio para analizar la población de cierto tipo de roedores en una comarca entre los años t=4 y t=8. En ese período la población viene dada por la función $P(t) = 4 + 360\,t - 66\,t^2 + 4\,t^3$ (en miles de roedores). Determinar durante qué años el número de miles de roedores se sitúa entre 662 y 814.

1) Along the interval of years: [5.57293,7.01803].

2) Along the interval of years: [4.,6.].

3) Along the interval of years: [4.12633,6.50885].

4) Along the interval of years: [6.,8.33025].

5) Along the interval of years: [7,8].

6) Along the intervals of years: [5.32537,6.11155] and [7.57668,8.71154].

7) Along the intervals of years: [4,7] and [8,8].

8) Along the intervals of years: [4.,6.] and [7.33996,8.].

Exercise 8

Compute the limit: $\lim_{x\to-\infty} 7 + 7x - 2x^2 - 7x^3 + 6x^4$

1) -4

2) 0

3) 1

4) $-\infty$

5) -5

6) -9

7) ∞

Exercise 9

The population of certain country (in millions of habitants) is given by the function $P(t) = 8\left(\frac{5-4t-t^2}{1+t-t^2}\right)^{3+t}$. Determine the future tendency for this population.

1) 0

2) $8\,e^5$

3) $8\,e^{2499/500}$

4) $\frac{8}{e^5}$

5) $-\infty$

6) 8

7) ∞

Exercise 10

The population in certain turistic area increases exponentially and is given by the function $P(t)=90\,000\,e^{t/100}$ that indicates the number of resident citizens for every year t. At the same time, depending on the season, the city receives a variable number of tourists given by the trigonometric function $I(t)=3000+2000\,\mathrm{Sin}\left[\frac{t}{2\pi}\right]$ that yields the amount of visitors in the area for every moment t (t in years). Determine how many years are necessary until the total nomber of habitants is 116000. (the solution can be found for t between 19 and 24).

1) t=**.0****

2) t=**.2****

3) t=**.4****

4) t=**.6****

5) t=**.8****

Exercise 11

Study the continuity of the function $f(x) = \begin{cases} 2\sin(x+3) - 2e^{x+3} & x \leq -3 \\ 2\sin(x+3) + 1 - 2\sin(1) & -3 < x < -2 \\ \sin(x+2) + \cos(x+2) & -2 \leq x \end{cases}$

1) The functions is continuous for all points.

2) The functions is not continuous at any point.

3) The function is continuous for all the points except for $x=-3$.

4) The function is continuous for all the points except for $x=-2$.

5) The function is continuous for all the points except for $x=-3$ and $x=-2$.

Mathematics 1 - ADE/FyCo - 2020/2021
List of exercises 01-Functions for identity number: 7511947

Exercise 1

We have two bank accounts, the first in the bank A and the second in the bank B. In the bank A we obtain a continuous compound rate of 10% and in the bank B we are paid a compound interes rate of 6%. We initially deposit 5000 euros in the bank A and 12 000 in B. How long time is it necessary until the money in both accounts is exactly the same?

Remark: To obtain a correct answer it is necessary to work with at least 5 decimal digits.

1) In **1.***** years.

2) In **9.***** years.

3) In **2.***** years.

4) In **0.***** years.

5) In **4.***** years.

Exercise 2

We have one bank account that offers a compound interes rate of 3% where we initially deposit 11 000 euros. How long time is it necessary until the amount of money in the account reaches 15 000 euros?

Remark: To obtain a correct answer it is necessary to work with at least 5 decimal digits.

1) In **2.***** years.

2) In **1.***** years.

3) In **0.***** years.

4) In **7.***** years.

5) In **4.***** years.

Exercise 3

We have a bank account that initially offers a periodic compound interes rate of 3% in 9 periods (compounding frequency), and after 3 years the conditions are modified and then we obtain a continuous compound rate of 9% . The initial deposit is 12 000 euros. Compute the amount of money in the account after 7 years from the moment of the first deposit.

1) We will have ****6.***** euros.

2) We will have ****7.***** euros.

3) We will have ****9.***** euros.

4) We will have ****8.***** euros.

5) We will have ****4.***** euros.

Exercise 4

A firm sells Q tons of certain product. The price received per ton is given by the formula P=14000−17Q. On the other hand, the production cost per ton is C=12000−6Q. In addition, the transportation cost is 1736 per ton. Compute the maximum profit that can be obtained selling this product.

1) Profit=1584.

2) Profit=2323.

3) Profit=1595.

4) Profit=1425.

5) Profit=1650.

Exercise 5

Deposits in certain investment account vary from year to year alternating gains and looses periods. We have the following data about the deposits for different years:

year	deposits
1	5
2	10
4	26

By means of a interpolation polynomial, obtain the function that yields the deposits in the account for every year t. Employ that function to forecast the exact amount for year 6.

1) The depositis in the account for year 6 are −4.

2) The depositis in the account for year 6 are −19.

3) The depositis in the account for year 6 are 1.

4) The depositis in the account for year 6 are 50.

5) The depositis in the account for year 6 are 65.

Exercise 6

The funds of a public institution alternate periods of deficit and surplus. We have the following information for several years (in millions of euros):

year	funds
1	6
5	86
7	162

Employ an interpolation polynomial to build a function that yields the funds for each year t. We know that due to the legislation the funds of such an institution have to be kept between 6 and 121. Compute (by means of the polynomial obtained before by interpolation) the periods along which the funds are between the indicated limits inside the interval of time where we have information (that is to say, from t=1 to t=7).

1) The funds are inside the limits for the inverval: $[-\frac{20}{3},-\frac{5}{3}]$.

2) The funds are inside the limits for the inverval: [0,1].

3) The funds are inside the limits for the inverval: $[-\frac{20}{3},7]$.

4) The funds are inside the limits for the inverval: $[-\frac{20}{3},0]$.

5) The funds are inside the limits for the inverval: [1,6].

6) The funds are inside the limits for the intervals: $[-\frac{20}{3},-\frac{5}{3}]$ y [6,7].

7) The funds are inside the limits for the inverval: $[-\frac{20}{3},1]$.

8) The funds are inside the limits for the inverval: [1,7].

Exercise 7

Se realiza un estudio para analizar la población de cierto tipo de roedores en una comarca entre los años t=3 y t=10. En ese período la población viene dada por la función $P(t) = 6 + 432\,t - 78\,t^2 + 4\,t^3$ (en miles de roedores). Determinar durante qué años el número de miles de roedores se sitúa entre 580 y 654.

1) Along the intervals of years: [5.60865,7.] and [8.,10.7343].

2) Along the intervals of years: [3,6] and [7,10].

3) Along the intervals of years: [6.12709,7.75632] and [8.7084,9.].

4) Along the intervals of years: [4.,5.] and [6.06498,9.].

5) Along the interval of years: [4.30017,6.].

6) Along the intervals of years: [5.02454,6.] and [9.26789,10.225].

7) Along the interval of years: [6,7].

8) Along the interval of years: [4.11123,7.].

Exercise 8

Compute the limit: $\lim_{x \to -\infty} \frac{5 - 4x + 2x^2}{6 + 7x - 9x^2}$

1) $-\frac{1}{5}$

2) 0

3) -1

4) $-\frac{2}{9}$

5) $-\infty$

6) ∞

7) 1

Exercise 9

From an initial deposit 11000, the interest rate varies every year in such a way that the total amount of money in the account is given by the function $C(t) = 11\,000 \left(\frac{-4 - 2t + 8t^2 - 2t^3}{-9 + 9t - 7t^2 - 2t^3}\right)^{-8+2t}$. Determine the future tendency for the deposits that we will have after a large number of years.

1) 0

2) $\frac{11\,000}{e^{15}}$

3) $-\infty$

4) ∞

5) $\frac{11\,000}{e^{3}}$

6) $\frac{11\,000}{e^{4}}$

7) 11 000

Exercise 10

We deposit 6000 euros in a bank account with a continuous compound rate of 6%. At the same time every year we also add in a safe-deposit box (therefore with no interest rate) 5000 euros. How long time is it necessary until the total ammount of money (jointly in the bank account and safe-depsit box) is 60000 euros? (the solution can be found for t between 6 and 11).

1) t=**.0****

2) t=**.2****

3) t=**.4****

4) t=**.6****

5) t=**.8****

Exercise 11

Study the continuity of the function $f(x)=\begin{cases} 2\cos(2-x)-\sin(2-x) & x\le 2 \\ 2-2\sin(2-x) & 2<x<3 \\ 2\log(x-2)+2 & 3\le x \end{cases}$

1) The functions is continuous for all points.

2) The functions is not continuous at any point.

3) The function is continuous for all the points except for x=2.

4) The function is continuous for all the points except for x=3.

5) The function is continuous for all the points except for x=2 and x=3.

Mathematics 1 - ADE/FyCo - 2020/2021
List of exercises 01-Functions for identity number: 7803104

Exercise 1

We have two bank accounts, the first in the bank A and the second in the bank B. In the bank A we obtain a continuous compound rate of 7% and in the bank B we are paid a compound interes rate of 4%. We initially deposit 2000 euros in the bank A and 14 000 in B. How long time is it necessary until the money in both accounts is exactly the same?

Remark: To obtain a correct answer it is necessary to work with at least 5 decimal digits.

1) In **6.***** years.

2) In **3.***** years.

3) In **0.***** years.

4) In **4.***** years.

5) In **9.***** years.

Exercise 2

Certain parcel of land is revalued from an initial value of 215 000 euros until a final value of 460 000 euros along 5 years. Determine the rate of continuous compound interes for that revaluation.

Remark: To obtain a correct answer it is necessary to work with at least 5 decimal digits.

1) The interest rate is **5.*****%.

2) The interest rate is **0.*****%.

3) The interest rate is **4.*****%.

4) The interest rate is **2.*****%.

5) The interest rate is **1.*****%.

Exercise 3

We have a bank account that initially offers a compound interes rate of 5%, and after 3 years the conditions are modified and then we obtain a continuous compound rate of 6%. The initial deposit is 14 000 euros. Compute the amount of money in the account after 6 years from the moment of the first deposit.

1) We will have ****6.***** euros.

2) We will have ****4.***** euros.

3) We will have ****3.***** euros.

4) We will have ****9.***** euros.

5) We will have ****1.***** euros.

Exercise 4

A firm sells Q tons of certain product. The price received per ton is given by the formula $P=60000-4Q$. On the other hand, the production cost per ton is $C=50000+8Q$. In addition, the transportation cost is 8920 per ton. Compute the maximum profit that can be obtained selling this product.

1) Profit=20 168.

2) Profit=26 302.

3) Profit=24 300.

4) Profit=25 418.

5) Profit=40 295.

Exercise 5

Deposits in certain investment account vary from year to year alternating gains and looses periods. We have the following data about the deposits for different years:

year	deposits
0	1
2	113
3	163

By means of a interpolation polynomial, obtain the function that yields the deposits in the account for every year t. Employ that function to determine the maximum funds available in the investment account.

1) The maximum for the depositis in the account was -1.

2) The maximum for the depositis in the account was 8.

3) The maximum for the depositis in the account was 15.

4) The maximum for the depositis in the account was 451.

5) The maximum for the depositis in the account was 251.

Exercise 6

The funds of a public institution alternate periods of deficit and surplus.
We have the following information for several years (in millions of euros):

year	funds
2	18
5	9
7	−7

Employ an interpolation polynomial to build a function that yields the funds for each year t. We know that due to the legislation the funds of such an institution have to be kept between 14 and 17. Compute (by means of the polynomial obtained before by interpolation) the periods along which the funds are between the indicated limits inside the interval of time where we have information (that is to say, from t=2 to t=7).

1) The funds are inside the limits for the inverval: [3,4].

2) The funds are inside the limits for the intervals: [0,0] y [3,4].

3) The funds are inside the limits for the inverval: [0,1].

4) The funds are inside the limits for the inverval: [1,7].

5) The funds are inside the limits for the inverval: [0,4].

6) The funds are inside the limits for the inverval: [1,4].

7) The funds are inside the limits for the intervals: [0,1] y [3,7].

8) The funds are inside the limits for the inverval: [4,7].

Exercise 7

Se realiza un estudio para analizar la población de cierto tipo de roedores en una comarca entre los años t=4 y t=10. En ese período la población viene dada por la función $P(t) = 9 + 672\,t - 90\,t^2 + 4\,t^3$ (en miles de roedores). Determinar durante qué años el número de miles de roedores se sitúa entre 1323 y 1665.

1) Along the interval of years: [6.,8.].

2) Along the intervals of years: [4.,7.] and [9.4325,10.].

3) Along the interval of years: [5.37301,9.].

4) Along the interval of years: [5.76339,8.].

5) Along the intervals of years: [4,4] and [6,10].

6) Along the interval of years: [5.75707,8.57708].

7) Along the intervals of years: [4.38843,5.] and [6.,9.32672].

8) Along the interval of years: [4,6].

Exercise 8

Compute the limit: $\lim_{x\to-\infty}\frac{7+x-x^2}{6-x+4x^2}$

1) $-\frac{1}{4}$

2) $-\infty$

3) ∞

4) $-\frac{3}{4}$

5) 1

6) -2

7) 0

Exercise 9

The population of certain country (in millions of habitants) is given by the function $P(t) = 9\left(\frac{7+4t+9t^2}{2-3t+9t^2}\right)^{5+7t}$. Determine the future tendency for this population.

1) $\frac{9}{e^5}$

2) $-\infty$

3) $9e^{1089/200}$

4) 0

5) 9

6) $9e^{49/9}$

7) ∞

Exercise 10

The population in certain turistic area increases exponentially and is given by the function $P(t) = 64000\, e^{t/100}$ that indicates the number of resident citizens for every year t. At the same time, depending on the season, the city receives a variable number of tourists given by the trigonometric function $I(t) = 5000 + 1000\, \mathrm{Sin}\left[\frac{t}{2\pi}\right]$ that yields the amount of visitors in the area for every moment t (t in years). Determine how many years are necessary until the total nomber of habitants is 98000. (the solution can be found for t between 33 and 38).

1) t=**.0****

2) t=**.2****

3) t=**.4****

4) t=**.6****

5) t=**.8****

Exercise 11

Study the continuity of the function $f(x) = \begin{cases} e^{x+2} + 3\sin(x+2) & x \le -2 \\ \sin(x+2) - 1 - \sin(2) & -2 < x < 0 \\ \sin(x) - \cos(x) & 0 \le x \end{cases}$

1) The functions is continuous for all points.

2) The functions is not continuous at any point.

3) The function is continuous for all the points except for $x=-2$.

4) The function is continuous for all the points except for $x=0$.

5) The function is continuous for all the points except for $x=-2$ and $x=0$.

Mathematics 1 - ADE/FyCo - 2020/2021
List of exercises 01-Functions for identity number: 8623226

Exercise 1

We have two bank accounts, the first in the bank A and the second in the bank B. In the bank A we obtain a periodic compound interes rate of 5% in 2 periods (compounding frequency) and in the bank B we are paid a compound interes rate of 10%. We initially deposit 6000 euros in the bank A and 2000 in B. How long time is it necessary until the money in both accounts is exactly the same?

Remark: To obtain a correct answer it is necessary to work with at least 5 decimal digits.

1) In **0.***** years.

2) In **5.***** years.

3) In **3.***** years.

4) In **2.***** years.

5) In **6.***** years.

Exercise 2

We have one bank account that offers a compound interes rate of 2% where we initially deposit 8000 euros. How long time is it necessary until the amount of money in the account reaches 17 000 euros?

Remark: To obtain a correct answer it is necessary to work with at least 5 decimal digits.

1) In **0.***** years.

2) In **4.***** years.

3) In **8.***** years.

4) In **2.***** years.

5) In **6.***** years.

Exercise 3

We have a bank account that initially offers a continuous compound rate of 10%, and after 2 years the conditions are modified and then we obtain a compound interes rate of 8%. The initial deposit is 6000 euros. Compute the amount of money in the account after 2 years from the moment of the first deposit.

1) We will have ****0.***** euros.

2) We will have ****7.***** euros.

3) We will have ****8.***** euros.

4) We will have ****2.***** euros.

5) We will have ****6.***** euros.

Exercise 4

A firm sells Q tons of certain product. The price received per ton is given by the formula P=20000-5Q. On the other hand, the production cost per ton is C=10000+13Q. In addition, the transportation cost is 8668 per ton. Compute the maximum profit that can be obtained selling this product.

1) Profit=33 003.

2) Profit=20 620.

3) Profit=24 642.

4) Profit=33 685.

5) Profit=10 100.

Exercise 5

Deposits in certain investment account vary from year to year alternating gains and looses periods. We have the following data about the deposits for different years:

year	deposits
0	3
2	3
3	6

By means of a interpolation polynomial, obtain the function that yields the deposits in the account for every year t. Employ that function to forecast the exact amount for year 4.

1) The depositis in the account for year 4 are -11.

2) The depositis in the account for year 4 are 6.

3) The depositis in the account for year 4 are 11.

4) The depositis in the account for year 4 are 14.

5) The depositis in the account for year 4 are 18.

Exercise 6

The funds of a public institution alternate periods of deficit and surplus. We have the following information for several years (in millions of euros):

year	funds
0	13
3	4
7	20

Employ an interpolation polynomial to build a function that yields the funds for each year t. We know that due to the legislation the funds of such an institution have to be kept between 8 and 13. Compute (by means of the polynomial obtained before by interpolation) the periods along which the funds are between the indicated limits inside the interval of time where we have information (that is to say, from t=0 to t=7).

1) The funds are inside the limits for the inverval: [0,7].

2) The funds are inside the limits for the inverval: [0,1].

3) The funds are inside the limits for the intervals: [0,1] y [6,7].

4) The funds are inside the limits for the inverval: [0,0].

5) The funds are inside the limits for the inverval: [5,7].

6) The funds are inside the limits for the inverval: [0,5].

7) The funds are inside the limits for the intervals: [0,1] y [5,6].

8) The funds are inside the limits for the inverval: [-2,4].

Exercise 7

The population of a city is studied between years t=0 and t=10. In that period the population is given by the function $P(t)=3+252t-60t^2+4t^3$. Determine the intervals of years when the population is between 263 and 307.

1) Along the interval of years: [6.,10.].

2) Along the interval of years: [4.,10.].

3) Along the intervals of years: [2.,4.] and [6.10878,7.].

4) Along the interval of years: [3.,5.].

5) Along the interval of years: [-4.45015×10^{-308},5.].

6) Along the intervals of years: [1.62598,6.] and [8.,9.24971].

7) Along the intervals of years: [1.5359,2.1459], [4,5] and [8.4641,8.8541].

8) Along the intervals of years: [0,1.5359], [2.1459,4], [5,8.4641] and [8.8541,10].

Exercise 8

Compute the limit: $\lim_{x\to\infty}\left(\frac{4+8x-2x^2}{-5+5x-2x^2}\right)^{-9-7x+3x^2}$

1) 1

2) $\frac{1}{e^5}$

3) 0

4) $-\infty$

5) $\frac{1}{e^2}$

6) ∞

7) $\frac{1}{e^4}$

Exercise 9

The population of certain country (in millions of habitants) is given by the function $P(t)=5\left(\frac{-1+6t+2t^2}{2+8t+2t^2}\right)^{6-t+2t^2}$. Determine the future tendency for this population.

1) $\frac{5}{e^5}$

2) $\frac{5}{e^4}$

3) 5

4) 0

5) $-\infty$

6) ∞

7) $\frac{5}{e^3}$

Exercise 10

We deposit 7000 euros in a bank account with a compound interes rate of 8%. At the same time every year we also add in a safe-deposit box (therefore with no interest rate) 5000 euros. How long time is it necessary until the total ammount of money (jointly in the bank account and safe-depsit box) is 48000 euros? (the solution can be found for t between 4 and 9).

1) t=**.1****

2) t=**.3****

3) t=**.5****

4) t=**.7****

5) t=**.9****

Exercise 11

Study the continuity of the function $f(x) = \begin{cases} \sin(x+2) + 2\cos(x+2) & x \leq -2 \\ -x & -2 < x < -1 \\ 1 - 3\log(x+2) & -1 \leq x \end{cases}$

1) The functions is continuous for all points.

2) The functions is not continuous at any point.

3) The function is continuous for all the points except for x=−2.

4) The function is continuous for all the points except for x=−1.

5) The function is continuous for all the points except for x=−2 and x=−1.

Mathematics 1 - ADE/FyCo - 2020/2021
List of exercises 01-Functions for identity number: 8792788

Exercise 1

We have two bank accounts, the first in the bank A and the second in the bank B. In the bank A we obtain a periodic compound interes rate of 6% in 3 periods (compounding frequency) and in the bank B we are paid a compound interes rate of 2%. We initially deposit 1000 euros in the bank A and 7000 in B. How long time is it necessary until the money in both accounts is exactly the same?

Remark: To obtain a correct answer it is necessary to work with at least 5 decimal digits.

1) In **8.***** years.

2) In **3.***** years.

3) In **9.***** years.

4) In **5.***** years.

5) In **0.***** years.

Exercise 2

We have one bank account that offers a continuous compound rate of 3% where we initially deposit 9000 euros. How long time is it necessary until the amount of money in the account reaches 11 000 euros?

Remark: To obtain a correct answer it is necessary to work with at least 5 decimal digits.

1) In **0.***** years.

2) In **1.***** years.

3) In **8.***** years.

4) In **6.***** years.

5) In **4.***** years.

Exercise 3

We have a bank account that initially offers a compound interes rate of 3%, and after 2 years the conditions are modified and then we obtain a periodic compound interes rate of 4% in 8 periods (compounding frequency). The initial deposit is 7000 euros. Compute the amount of money in the account after 3 years from the moment of the first deposit.

1) We will have ****1.***** euros.

2) We will have ****9.***** euros.

3) We will have ****8.***** euros.

4) We will have ****5.***** euros.

5) We will have ****0.***** euros.

Exercise 4

A firm sells Q tons of certain product. The price received per ton is given by the formula P=15000-6Q. On the other hand, the production cost per ton is C=3000+12Q. In addition, the transportation cost is 11352 per ton. Compute the maximum profit that can be obtained selling this product.

1) Profit=5832.

2) Profit=2480.

3) Profit=5098.

4) Profit=3564.

5) Profit=2274.

Exercise 5

Deposits in certain investment account vary from year to year alternating gains and looses periods. We have the following data about the deposits for different years:

year	deposits
0	0
2	-10
3	-21

By means of a interpolation polynomial, obtain the function that yields the deposits in the account for every year t. Employ that function to forecast the exact amount for year 4.

1) The depositis in the account for year 4 are -55.

2) The depositis in the account for year 4 are -13.

3) The depositis in the account for year 4 are 4.

4) The depositis in the account for year 4 are -36.

5) The depositis in the account for year 4 are -1.

Exercise 6

The funds of a public institution alternate periods of deficit and surplus. We have the following information for several years (in millions of euros):

year	funds
0	1
4	9
6	25

Employ an interpolation polynomial to build a function that yields the funds for each year t. We know that due to the legislation the funds of such an institution have to be kept between 4 and 40. Compute (by means of the polynomial obtained before by interpolation) the periods along which the funds are between the indicated limits inside the interval of time where we have information (that is to say, from t=0 to t=6).

1) The funds are inside the limits for the inverval: [-2,3].

2) The funds are inside the limits for the inverval: [-1,4].

3) The funds are inside the limits for the inverval: [-1,3].

4) The funds are inside the limits for the inverval: [3,6].

5) The funds are inside the limits for the inverval: [0,6].

6) The funds are inside the limits for the inverval: [0,3].

7) The funds are inside the limits for the inverval: [6,6].

8) The funds are inside the limits for the inverval: [-1,6].

Exercise 7

Se realiza un estudio para analizar la población de cierto tipo de roedores en una comarca entre los años t=1 y t=7. En ese período la población viene dada por la función $P(t) = 4 + 120\,t - 42\,t^2 + 4\,t^3$ (en miles de roedores). Determinar durante qué años el número de miles de roedores se sitúa entre 68 y 94.

1) Along the interval of years: [2.50138,7.].

2) Along the intervals of years: [1,1], [1.18826,3], [4,5.81174] and [6.31174,7].

3) Along the interval of years: [6.,7.4652].

4) Along the intervals of years: [1.15984,3.] and [4.62961,6.].

5) Along the interval of years: [1.36424,6.43298].

6) Along the intervals of years: [1,1.18826], [3,4] and [5.81174,6.31174].

7) Along the interval of years: [3.29343,5.].

8) Along the interval of years: [4.17658,6.].

Exercise 8

Compute the limit: $\lim_{x\to\infty} -6 + 5x - 5x^2 - 6x^3 - 5x^4$

1) 1

2) 0

3) $-\infty$

4) -5

5) -9

6) ∞

7) -7

Exercise 9

A factory produces certain type of devices. The marginal cost (cost of producing one unit) decreases when we produce a large amount of units and it is given by the function $C(x) = \frac{6 + 3x + 3x^2}{9 + 6x + 6x^2}$. Determine the expected cost per unit when a large amount of units is produced.

1) $\frac{1}{2}$

2) 0

3) $-\infty$

4) $-\frac{1}{2}$

5) $\frac{53}{100}$

6) 3000

7) ∞

Exercise 10

We deposit 9000 euros in a bank account with a periodic compound interes rate of 9% in 4 periods (compounding frequency). At the same time every year we also add in a safe-deposit box (therefore with no interest rate) 3000 euros. How long time is it necessary until the total ammount of money (jointly in the bank account and safe-depsit box) is 39000 euros? (the solution can be found for t between 4 and 9).

1) t=**.0****

2) t=**.2****

3) t=**.4****

4) t=**.6****

5) t=**.8****

Exercise 11

Study the continuity of the function $f(x) = \begin{cases} -3\sin(x+1) - \cos(x+1) & x \le -1 \\ -1 & -1 < x < 0 \\ -e^{x} & 0 \le x \end{cases}$

1) The functions is continuous for all points.

2) The functions is not continuous at any point.

3) The function is continuous for all the points except for $x=-1$.

4) The function is continuous for all the points except for $x=0$.

5) The function is continuous for all the points except for $x=-1$ and $x=0$.

Mathematics 1 - ADE/FyCo - 2020/2021
List of exercises 01-Functions for identity number: 9214549

Exercise 1

We have two bank accounts, the first in the bank A and the second in the bank B. In the bank A we obtain a compound interes rate of 2% and in the bank B we are paid a compound interes rate of 7%. We initially deposit 8000 euros in the bank A and 4000 in B. How long time is it necessary until the money in both accounts is exactly the same?

Remark: To obtain a correct answer it is necessary to work with at least 5 decimal digits.

1) In **4.***** years.

2) In **0.***** years.

3) In **1.***** years.

4) In **2.***** years.

5) In **7.***** years.

Exercise 2

We have one bank account that offers a periodic compound interes rate of 4% in 10 periods (compounding frequency) where we initially deposit 11 000 euros. How long time is it necessary until the amount of money in the account reaches 18 000 euros?

Remark: To obtain a correct answer it is necessary to work with at least 5 decimal digits.

1) In **6.***** years.

2) In **7.***** years.

3) In **5.***** years.

4) In **2.***** years.

5) In **0.***** years.

Exercise 3

We have a bank account that initially offers a continuous compound rate of 4%, and after 3 years the conditions are modified and then we obtain a periodic compound interes rate of 8% in 6 periods (compounding frequency). The initial deposit is 8000 euros. Compute the amount of money in the account after 3 years from the moment of the first deposit.

1) We will have ****9.***** euros.

2) We will have ****0.***** euros.

3) We will have ****8.***** euros.

4) We will have ****2.***** euros.

5) We will have ****7.***** euros.

Exercise 4

A firm sells Q tons of certain product. The price received per ton is given by the formula P=30000-8Q. On the other hand, the production cost per ton is C=10000+6Q. In addition, the transportation cost is 18740 per ton. Compute the maximum profit that can be obtained selling this product.

1) Profit=42 799.

2) Profit=24 059.

3) Profit=43 324.

4) Profit=44 448.

5) Profit=28 350.

Exercise 5

Deposits in certain investment account vary from year to year alternating gains and looses periods. We have the following data about the deposits for different years:

year	deposits
1	1
2	-5
4	-29

By means of a interpolation polynomial, obtain the function that yields the deposits in the account for every year t. Employ that function to forecast the exact amount for year 6.

1) The depositis in the account for year 6 are 1.

2) The depositis in the account for year 6 are 12.

3) The depositis in the account for year 6 are -95.

4) The depositis in the account for year 6 are -69.

5) The depositis in the account for year 6 are -19.

Exercise 6

The funds of a public institution alternate periods of deficit and surplus. We have the following information for several years (in millions of euros):

year	funds
0	2
2	8
6	92

Employ an interpolation polynomial to build a function that yields the funds for each year t. We know that due to the legislation the funds of such an institution have to be kept between 2 and 20. Compute (by means of the polynomial obtained before by interpolation) the periods along which the funds are between the indicated limits inside the interval of time where we have information (that is to say, from t=0 to t=6).

1) The funds are inside the limits for the inverval: [3,6].

2) The funds are inside the limits for the inverval: [0,3].

3) The funds are inside the limits for the inverval: [-2,6].

4) The funds are inside the limits for the inverval: [-2,3].

5) The funds are inside the limits for the inverval: [-2,5].

6) The funds are inside the limits for the inverval: [-1,3].

7) The funds are inside the limits for the inverval: [0,6].

8) The funds are inside the limits for the inverval: [6,6].

Exercise 7

Se realiza un estudio para analizar la población de cierto tipo de roedores en una comarca entre los años t=1 y t=9. En ese período la población viene dada por la función $P(t) = 7 + 336\,t - 66\,t^2 + 4\,t^3$ (en miles de roedores). Determinar durante qué años el número de miles de roedores se sitúa entre 511 y 537.

1) Along the interval of years: [7.53836,8.].

2) Along the intervals of years: [1.,3.] and [4.75016,5.].

3) Along the intervals of years: [2.68826,3.18826], [5,6] and [7.81174,8.31174].

4) Along the intervals of years: [2.55673,3.] and [4.,9.].

5) Along the intervals of years: [1,2.68826], [3.18826,5], [6,7.81174] and [8.31174,9].

6) Along the interval of years: [5.,6.].

7) Along the intervals of years: [1.,6.08782] and [7.58546,8.].

8) Along the intervals of years: [2.,4.6311] and [5.41207,7.].

Exercise 8

Compute the limit: $\lim_{x\to-\infty}\left(\frac{-7-2x+8x^2}{5+8x+8x^2}\right)^{-6-4x+2x^2}$

1) $\frac{1}{e^2}$

2) ∞

3) 1

4) $\frac{1}{e^4}$

5) 0

6) $\frac{1}{e^3}$

7) $-\infty$

Exercise 9

From an initial deposit 20000, the interest rate varies every year in such a way that the total amount of money in the account is given by the function $C(t) = 20\,000\left(\frac{-1+4t+7t^2}{-2-2t+7t^2}\right)^{1+5t}$. Determine the future tendency for the deposits that we will have after a large number of years.

1) $\frac{20\,000}{e^4}$

2) $20\,000\, e^{1071/250}$

3) 0

4) $-\infty$

5) ∞

6) 20 000

7) $20\,000\, e^{30/7}$

Exercise 10

We deposit 13000 euros in a bank account with a compound interes rate of 1%. At the same time every year we also add in a safe-deposit box (therefore with no interest rate) 3000 euros. How long time is it necessary until the total ammount of money (jointly in the bank account and safe-depsit box) is 58000 euros? (the solution can be found for t between 12 and 17).

1) t=**.1****

2) t=**.3****

3) t=**.5****

4) t=**.7****

5) t=**.9****

Exercise 11

Study the continuity of the function $f(x) = \begin{cases} 3\sin(x) - \cos(x) & x \leq 0 \\ 4x - 3 & 0 < x < 1 \\ 1 - 3\log(x) & 1 \leq x \end{cases}$

1) The functions is continuous for all points.

2) The functions is not continuous at any point.

3) The function is continuous for all the points except for x=0.

4) The function is continuous for all the points except for x=1.

5) The function is continuous for all the points except for x=0 and x=1.

Mathematics 1 - ADE/FyCo - 2020/2021
List of exercises 01-Functions for identity number: 9810258

Exercise 1

We have two bank accounts, the first in the bank A and the second in the bank B. In the bank A we obtain a continuous compound rate of 2% and in the bank B we are paid a periodic compound interes rate of 6% in 12 periods (compounding frequency). We initially deposit 10 000 euros in the bank A and 2000 in B. How long time is it necessary until the money in both accounts is exactly the same?

Remark: To obtain a correct answer it is necessary to work with at least 5 decimal digits.

1) In **5.***** years.

2) In **0.***** years.

3) In **8.***** years.

4) In **2.***** years.

5) In **4.***** years.

Exercise 2

We have one bank account that offers a periodic compound interes rate of 4% in 5 periods (compounding frequency) where we initially deposit 15 000 euros. How long time is it necessary until the amount of money in the account reaches 21 000 euros?

Remark: To obtain a correct answer it is necessary to work with at least 5 decimal digits.

1) In **0.***** years.

2) In **8.***** years.

3) In **5.***** years.

4) In **2.***** years.

5) In **4.***** years.

Exercise 3

We have a bank account that initially offers a continuous compound rate of 4%, and after 1 year the conditions are modified and then we obtain a continuous compound rate of 7%. The initial deposit is 10 000 euros. Compute the amount of money in the account after 3 years from the moment of the first deposit.

1) We will have ****2.***** euros.

2) We will have ****0.***** euros.

3) We will have ****7.***** euros.

4) We will have ****8.***** euros.

5) We will have ****4.***** euros.

Exercise 4

A firm sells Q tons of certain product. The price received per ton is given by the formula P=15000-12Q. On the other hand, the production cost per ton is C=2000+6Q. In addition, the transportation cost is 12424 per ton. Compute the maximum profit that can be obtained selling this product.

1) Profit=3842.

2) Profit=4608.

3) Profit=5096.

4) Profit=5747.

5) Profit=6138.

Exercise 5

Deposits in certain investment account vary from year to year alternating gains and looses periods. We have the following data about the deposits for different years:

year	deposits
0	3
1	3
3	-9

By means of a interpolation polynomial, obtain the function that yields the deposits in the account for every year t. Employ that function to forecast the exact amount for year 5.

1) The depositis in the account for year 5 are -37.

2) The depositis in the account for year 5 are -16.

3) The depositis in the account for year 5 are -1.

4) The depositis in the account for year 5 are -57.

5) The depositis in the account for year 5 are 8.

Exercise 6

The funds of a public institution alternate periods of deficit and surplus. We have the following information for several years (in millions of euros):

year	funds
1	29
4	38
6	34

Employ an interpolation polynomial to build a function that yields the funds for each year t. We know that due to the legislation the funds of such an institution have to be kept between 29 and 37 . Compute (by means of the polynomial obtained before by interpolation) the periods along which the funds are between the indicated limits inside the interval of time where we have information (that is to say, from t=1 to t=6).

1) The funds are inside the limits for the inverval: [1,3].

2) The funds are inside the limits for the inverval: [3,7].

3) The funds are inside the limits for the intervals: [1,3] y [5,6].

4) The funds are inside the limits for the inverval: [3,6].

5) The funds are inside the limits for the inverval: [6,7].

6) The funds are inside the limits for the inverval: [0,3].

7) The funds are inside the limits for the inverval: [0,7].

8) The funds are inside the limits for the intervals: [0,1] y [5,7].

Exercise 7

Se realiza un estudio para analizar la población de cierto tipo de roedores en una comarca entre los años t=2 y t=9. En ese período la población viene dada por la función $P(t) = 7 + 480\,t - 78\,t^2 + 4\,t^3$ (en miles de roedores). Determinar durante qué años el número de miles de roedores se sitúa entre 917 y 943.

1) Along the interval of years: [3.6716,5.67501].

2) Along the intervals of years: [3.68826,4.18826], [6,7] and [8.81174,9].

3) Along the intervals of years: [2,3.68826], [4.18826,6], [7,8.81174] and [9,9].

4) Along the interval of years: [3.48747,7.05449].

5) Along the interval of years: [2.,5.38707].

6) Along the intervals of years: [4.75952,6.49182] and [7.,9.].

7) Along the interval of years: [5.,8.15779].

8) Along the intervals of years: [2.64277,3.7639] and [5.42553,6.28211].

Exercise 8

Compute the limit: $\lim_{x\to-\infty}\left(\frac{-2-x+4x^2}{2-5x+4x^2}\right)^{1-8x+x^2}$

1) e^2

2) $\frac{1}{e^3}$

3) ∞

4) 0

5) $-\infty$

6) 1

7) $\frac{1}{e^2}$

Exercise 9

A factory produces certain type of devices. The marginal cost (cost of producing one unit) decreases when we produce a large amount of units and it is given by the function $C(x)=\frac{9+6x+4x^2+7x^3}{8+8x+7x^2+7x^3}$. Determine the expected cost per unit when a large amount of units is produced.

1) ∞

2) 20 000

3) $-\infty$

4) -2

5) 0

6) 1

7) $\frac{109}{100}$

Exercise 10

We deposit 16000 euros in a bank account with a continuous compound rate of 2%. At the same time every year we also add in a safe-deposit box (therefore with no interest rate) 5000 euros. How long time is it necessary until the total ammount of money (jointly in the bank account and safe-depsit box) is 61000 euros? (the solution can be found for t between 5 and 10).

1) t=**.0****

2) t=**.2****

3) t=**.4****

4) t=**.6****

5) t=**.8****

Exercise 11

Study the continuity of the function $f(x) = \begin{cases} -3\sin(2-x) - \cos(2-x) & x \le 2 \\ \frac{3x}{2} - 4 & 2 < x < 4 \\ 2\cos(4-x) & 4 \le x \end{cases}$

1) The functions is continuous for all points.

2) The functions is not continuous at any point.

3) The function is continuous for all the points except for x=2.

4) The function is continuous for all the points except for x=4.

5) The function is continuous for all the points except for x=2 and x=4.

Mathematics 1 - ADE/FyCo - 2020/2021
List of exercises 01-Functions for identity number: 13082921

Exercise 1

We have two bank accounts, the first in the bank A and the second in the bank B. In the bank A we obtain a compound interes rate of 8% and in the bank B we are paid a periodic compound interes rate of 5% in 4 periods (compounding frequency). We initially deposit 5000 euros in the bank A and 13 000 in B. How long time is it necessary until the money in both accounts is exactly the same?

Remark: To obtain a correct answer it is necessary to work with at least 5 decimal digits.

1) In **4.***** years.

2) In **0.***** years.

3) In **2.***** years.

4) In **6.***** years.

5) In **5.***** years.

Exercise 2

Certain parcel of land is devalued from an initial value of 298 000 euros until a final value of 154 000 euros along 9 years. Determine the rate of periodic compound interes in 5 periods for that devaluation.

Remark: To obtain a correct answer it is necessary to work with at least 5 decimal digits.

1) The interest rate is **1.*****%.

2) The interest rate is **5.*****%.

3) The interest rate is **8.*****%.

4) The interest rate is **2.*****%.

5) The interest rate is **7.*****%.

Exercise 3

We have a bank account that initially offers a compound interes rate of 2%, and after 1 year the conditions are modified and then we obtain a continuous compound rate of 4%. The initial deposit is 13 000 euros. Compute the amount of money in the account after 9 years from the moment of the first deposit.

1) We will have ****5.***** euros.

2) We will have ****1.***** euros.

3) We will have ****2.***** euros.

4) We will have ****6.***** euros.

5) We will have ****0.***** euros.

Exercise 4

A firm sells Q tons of certain product. The price received per ton is given by the formula P=9000-17Q. On the other hand, the production cost per ton is C=6000-5Q. In addition, the transportation cost is 2592 per ton. Compute the maximum profit that can be obtained selling this product.

1) Profit=4039.

2) Profit=5413.

3) Profit=3468.

4) Profit=3797.

5) Profit=5577.

Exercise 5

Deposits in certain investment account vary from year to year alternating gains and looses periods. We have the following data about the deposits for different years:

year	deposits
0	81
1	59
3	27

By means of a interpolation polynomial, obtain the function that yields the deposits in the account for every year t. Employ that function to determine the minimum funds available in the investment account.

1) The minimum for the depositis in the account was 15.

2) The minimum for the depositis in the account was -6.

3) The minimum for the depositis in the account was 6.

4) The minimum for the depositis in the account was 9.

5) The minimum for the depositis in the account was 3.

Exercise 6

The funds of a public institution alternate periods of deficit and surplus. We have the following information for several years (in millions of euros):

year	funds
2	12
6	108
9	243

Employ an interpolation polynomial to build a function that yields the funds for each year t. We know that due to the legislation the funds of such an institution have to be kept between 27 and 147 . Compute (by means of the polynomial obtained before by interpolation) the periods along which the funds are between the indicated limits inside the interval of time where we have information (that is to say, from t=2 to t=9).

1) The funds are inside the limits for the inverval: [-7,3].

2) The funds are inside the limits for the intervals: [-7,-3] y [7,9].

3) The funds are inside the limits for the inverval: [3,7].

4) The funds are inside the limits for the inverval: [3,9].

5) The funds are inside the limits for the inverval: [0,3].

6) The funds are inside the limits for the inverval: [-7,0].

7) The funds are inside the limits for the inverval: [-7,9].

8) The funds are inside the limits for the inverval: [-7,-3].

Exercise 7

The population of a city is studied between years t=2 and t=10. In that period the population is given by the function $P(t)=8+288t-60t^2+4t^3$. Determine the intervals of years when the population is between 888 and 1240.

1) Along the interval of years: [2,10].

2) Along the intervals of years: [3.34195,4.54256] and [9.,10.1568].

3) Along the interval of years: [4.,8.24631].

4) Along the interval of years: [10,10].

5) Along the interval of years: [3.,8.61087].

6) That number of mice is reach for no interval of years.

7) Along the intervals of years: [4.,5.] and [7.26324,9.4424].

8) Along the interval of years: [4.,5.].

Exercise 8

Compute the limit: $\lim_{x\to-\infty}\dfrac{-7+4x-x^2-5x^3}{5+2x+8x^2+8x^3}$

1) 0

2) $-\frac{2}{3}$

3) $-\frac{2}{5}$

4) $-\frac{5}{8}$

5) ∞

6) $-\infty$

7) 1

Exercise 9

The population of certain country (in millions of habitants) is given by the function $P(t)=28\left(\dfrac{-7+6t+9t^2}{2-9t+9t^2}\right)^{9+t+4t^2}$. Determine the future tendency for this population.

1) $\frac{28}{e^5}$

2) 0

3) $-\infty$

4) $\frac{28}{e^4}$

5) ∞

6) 28

7) $\frac{28}{e^2}$

Exercise 10

The population in certain turistic area increases exponentially and is given by the function $P(t)=56000\,e^{t/50}$ that indicates the number of resident citizens for every year t. At the same time, depending on the season, the city receives a variable number of tourists given by the trigonometric function $I(t)=2000+1000\,\mathrm{Sin}\left[\dfrac{t}{2\pi}\right]$ that yields the amount of visitors in the area for every moment t (t in years). Determine how many years are necessary until the total nomber of habitants is 86000. (the solution can be found for t between 19 and 24).

1) t=**.1****

2) t=**.3****

3) t=**.5****

4) t=**.7****

5) t=**.9****

Exercise 11

Study the continuity of the function $f(x) = \begin{cases} e^{x-3} - 2\sin(3-x) & x \le 3 \\ 4 - x & 3 < x < 5 \\ -\sin(5-x) - 2\cos(5-x) & 5 \le x \end{cases}$

1) The functions is continuous for all points.

2) The functions is not continuous at any point.

3) The function is continuous for all the points except for x=3.

4) The function is continuous for all the points except for x=5.

5) The function is continuous for all the points except for x=3 and x=5.

Mathematics 1 - ADE/FyCo - 2020/2021
List of exercises 01-Functions for identity number: 21055224

Exercise 1

We have two bank accounts, the first in the bank A and the second in the bank B. In the bank A we obtain a periodic compound interes rate of 9% in 4 periods (compounding frequency) and in the bank B we are paid a compound interes rate of 6% . We initially deposit 3000 euros in the bank A and 9000 in B. How long time is it necessary until the money in both accounts is exactly the same?

Remark: To obtain a correct answer it is necessary to work with at least 5 decimal digits.

1) In **5.***** years.

2) In **9.***** years.

3) In **0.***** years.

4) In **3.***** years.

5) In **6.***** years.

Exercise 2

We have one bank account that offers a compound interes rate of 3% where we initially deposit 14000 euros. How long time is it necessary until the amount of money in the account reaches 20000 euros?

Remark: To obtain a correct answer it is necessary to work with at least 5 decimal digits.

1) In **6.***** years.

2) In **2.***** years.

3) In **5.***** years.

4) In **3.***** years.

5) In **0.***** years.

Exercise 3

We have a bank account that initially offers a continuous compound rate of 10%, and after 1 year the conditions are modified and then we obtain a continuous compound rate of 2% . The initial deposit is 9000 euros. Compute the amount of money in the account after 7 years from the moment of the first deposit.

1) We will have ****1.***** euros.

2) We will have ****3.***** euros.

3) We will have ****4.***** euros.

4) We will have ****9.***** euros.

5) We will have ****2.***** euros.

Exercise 4

A firm sells Q tons of certain product. The price received per ton is given by the formula P=100000−11Q. On the other hand, the production cost per ton is C=60000+10Q. In addition, the transportation cost is 38656 per ton. Compute the maximum profit that can be obtained selling this product.

1) Profit=21 504.

2) Profit=21 865.

3) Profit=30 418.

4) Profit=35 842.

5) Profit=12 007.

Exercise 5

Deposits in certain investment account vary from year to year alternating gains and looses periods. We have the following data about the deposits for different years:

year	deposits
0	1
2	11
4	37

By means of a interpolation polynomial, obtain the function that yields the deposits in the account for every year t. Employ that function to forecast the exact amount for year 6.

1) The depositis in the account for year 6 are 2.

2) The depositis in the account for year 6 are 79.

3) The depositis in the account for year 6 are −7.

4) The depositis in the account for year 6 are 106.

5) The depositis in the account for year 6 are −18.

Exercise 6

The funds of a public institution alternate periods of deficit and surplus. We have the following information for several years (in millions of euros):

year	funds
1	24
3	24
7	0

Employ an interpolation polynomial to build a function that yields the funds for each year t. We know that due to the legislation the funds of such an institution have to be kept between 9 and 21 . Compute (by means of the polynomial obtained before by interpolation) the periods along which the funds are between the indicated limits inside the interval of time where we have information (that is to say, from t=1 to t=7).

1) The funds are inside the limits for the inverval: [6,7].

2) The funds are inside the limits for the intervals: [-2,0] y [4,6].

3) The funds are inside the limits for the inverval: [0,6].

4) The funds are inside the limits for the inverval: [0,0].

5) The funds are inside the limits for the intervals: [-2,0] y [4,7].

6) The funds are inside the limits for the inverval: [-2,0].

7) The funds are inside the limits for the inverval: [0,7].

8) The funds are inside the limits for the inverval: [4,6].

Exercise 7

Se realiza un estudio para analizar la población de cierto tipo de roedores en una comarca entre los años t=2 y t=8. En ese período la población viene dada por la función $P(t) = 5 + 180\,t - 48\,t^2 + 4\,t^3$ (en miles de roedores). Determinar durante qué años el número de miles de roedores se sitúa entre 213 y 285.

1) Along the intervals of years: [2.16485,4.37642] and [6.37646,7.11004].

2) Along the intervals of years: [3.,4.] and [5.,7.75428].

3) Along the intervals of years: [2.26795,4] and [5.73205,7].

4) Along the intervals of years: [2,2.26795], [4,5.73205] and [7,8].

5) Along the interval of years: [5.55912,8.42719].

6) Along the interval of years: [4.34771,7.7563].

7) Along the intervals of years: [3.,6.] and [7.,8.23312].

8) Along the intervals of years: [3.,5.19892] and [7.20601,8.].

Exercise 8

Compute the limit: $\lim_{x\to-\infty} -8 - 3x - 7x^2 + 8x^3 + 7x^4 + 6x^5$

1) ∞

2) -2

3) 0

4) -7

5) 1

6) $-\infty$

7) -3

Exercise 9

A factory produces certain type of devices. The marginal cost (cost of producing one unit) decreases when we produce a large amount of units and it is given by the function $C(x) = \frac{6 + 4x + 4x^2 + 9x^3 + 3x^4}{1 + 7x + 4x^2 + 4x^3 + 8x^4}$. Determine the expected cost per unit when a large amount of units is produced.

1) 0

2) $\frac{21}{50}$

3) 3000

4) $\frac{3}{8}$

5) $-\infty$

6) $-\frac{2}{7}$

7) ∞

Exercise 10

We deposit 19000 euros in a bank account with a continuous compound rate of 8%. At the same time every year we also add in a safe-deposit box (therefore with no interest rate) 1000 euros. How long time is it necessary until the total ammount of money (jointly in the bank account and safe-depsit box) is 64000 euros? (the solution can be found for t between 9 and 14).

1) t=**.0****

2) t=**.2****

3) t=**.4****

4) t=**.6****

5) t=**.8****

Exercise 11

Study the continuity of the function $f(x)=\begin{cases} 0 & x\le 1 \lor 1<x<3 \\ \sin(3-x)+2\cos(3-x) & 3\le x \end{cases}$

1) The functions is continuous for all points.

2) The functions is not continuous at any point.

3) The function is continuous for all the points except for x=1.

4) The function is continuous for all the points except for x=3.

5) The function is continuous for all the points except for x=1 and x=3.

Mathematics 1 - ADE/FyCo - 2020/2021
List of exercises 01-Functions for identity number: 24265165

Exercise 1

We have two bank accounts, the first in the bank A and the second in the bank B. In the bank A we obtain a compound interes rate of 1% and in the bank B we are paid a compound interes rate of 10%. We initially deposit 5000 euros in the bank A and 1000 in B. How long time is it necessary until the money in both accounts is exactly the same?

Remark: To obtain a correct answer it is necessary to work with at least 5 decimal digits.

1) In **1.***** years.

2) In **0.***** years.

3) In **8.***** years.

4) In **4.***** years.

5) In **6.***** years.

Exercise 2

Certain parcel of land is devalued from an initial value of 348 000 euros until a final value of 149 000 euros along 5 years. Determine the rate of periodic compound interes in 10 periods for that devaluation.

Remark: To obtain a correct answer it is necessary to work with at least 5 decimal digits.

1) The interest rate is **7.*****%.

2) The interest rate is **1.*****%.

3) The interest rate is **4.*****%.

4) The interest rate is **6.*****%.

5) The interest rate is **0.*****%.

Exercise 3

We have a bank account that initially offers a compound interes rate of 2%, and after 2 years the conditions are modified and then we obtain a compound interes rate of 8%. The initial deposit is 5000 euros. Compute the amount of money in the account after 10 years from the moment of the first deposit.

1) We will have ****1.***** euros.

2) We will have ****0.***** euros.

3) We will have ****8.***** euros.

4) We will have ****4.***** euros.

5) We will have ****6.***** euros.

Exercise 4

A firm sells Q tons of certain product. The price received per ton is given by the formula P=2000-2Q. On the other hand, the production cost per ton is C=1000+5Q. In addition, the transportation cost is 496 per ton. Compute the maximum profit that can be obtained selling this product.

1) Profit=3289.

2) Profit=7542.

3) Profit=9072.

4) Profit=9233.

5) Profit=10 996.

Exercise 5

Deposits in certain investment account vary from year to year alternating gains and looses periods. We have the following data about the deposits for different years:

year	deposits
2	93
3	67
4	45

By means of a interpolation polynomial, obtain the function that yields the deposits in the account for every year t. Employ that function to determine the minimum funds available in the investment account.

1) The minimum for the depositis in the account was 3.

2) The minimum for the depositis in the account was 8.

3) The minimum for the depositis in the account was 9.

4) The minimum for the depositis in the account was -5.

5) The minimum for the depositis in the account was 6.

Exercise 6

The funds of a public institution alternate periods of deficit and surplus. We have the following information for several years (in millions of euros):

year	funds
0	26
2	10
4	10

Employ an interpolation polynomial to build a function that yields the funds for each year t. We know that due to the legislation the funds of such an institution have to be kept between 10 and 16. Compute (by means of the polynomial obtained before by interpolation) the periods along which the funds are between the indicated limits inside the interval of time where we have information (that is to say, from t=0 to t=4).

1) The funds are inside the limits for the intervals: [0,2] y [4,5].

2) The funds are inside the limits for the inverval: [0,1].

3) The funds are inside the limits for the intervals: [1,2] y [4,4].

4) The funds are inside the limits for the intervals: [1,2] y [4,5].

5) The funds are inside the limits for the inverval: [1,4].

6) The funds are inside the limits for the inverval: [4,4].

7) The funds are inside the limits for the inverval: [0,4].

8) The funds are inside the limits for the inverval: [1,2].

Exercise 7

Se realiza un estudio para analizar la población de cierto tipo de roedores en una comarca entre los años t=4 y t=7. En ese período la población viene dada por la función $P(t) = 1 + 360\,t - 66\,t^2 + 4\,t^3$ (en miles de roedores). Determinar durante qué años el número de miles de roedores se sitúa entre 649 y 811.

1) Along the interval of years: [4.5643,5.08062].

2) Along the intervals of years: [4,4.5], [6,6] and [7,7].

3) Along the interval of years: [4.59434,7.].

4) Along the interval of years: [6.,7.71242].

5) Along the interval of years: [4.,5.].

6) Along the interval of years: [4.5,7].

7) Along the interval of years: [5.11438,7.22858].

8) Along the interval of years: [4.,7.63083].

Exercise 8

Compute the limit: $\lim_{x\to-\infty}\left(\frac{-7-2x+3x^2}{4-8x+3x^2}\right)^{8+x}$

1) $\frac{1}{e^3}$

2) e^2

3) $-\infty$

4) 0

5) $\frac{1}{e^5}$

6) ∞

7) 1

Exercise 9

A factory produces certain type of devices. The marginal cost (cost of producing one unit) decreases when we produce a large amount of units and it is given by the function $C(x)=\frac{5+3x+4x^2+6x^3}{1+3x+4x^2+9x^3+5x^4}$. Determine the expected cost per unit when a large amount of units is produced.

1) 1000

2) $-\infty$

3) $-\frac{1}{3}$

4) $-\frac{3}{5}$

5) 0

6) ∞

7) -1

Exercise 10

The population in certain turistic area increases exponentially and is given by the function $P(t) = 53000\, e^{t/50}$ that indicates the number of resident citizens for every year t. At the same time, depending on the season, the city receives a variable number of tourists given by the trigonometric function $I(t) = 5000 + 1000 \operatorname{Sin}\left[\frac{t}{2\pi}\right]$ that yields the amount of visitors in the area for every moment t (t in years). Determine how many years are necessary until the total nomber of habitants is 90000. (the solution can be found for t between 23 and 28).

1) t=**.1****

2) t=**.3****

3) t=**.5****

4) t=**.7****

5) t=**.9****

Exercise 11

Study the continuity of the function $f(x) = \begin{cases} e^{x+3} - 3\sin(x+3) & x \leq -3 \\ -3x - 8 & -3 < x < -2 \\ 3\log(x+3) - 2 & -2 \leq x \end{cases}$

1) The functions is continuous for all points.

2) The functions is not continuous at any point.

3) The function is continuous for all the points except for x=-3.

4) The function is continuous for all the points except for x=-2.

5) The function is continuous for all the points except for x=-3 and x=-2.

Mathematics 1 - ADE/FyCo - 2020/2021
List of exercises 01-Functions for identity number: 26052770

Exercise 1

We have two bank accounts, the first in the bank A and the second in the bank B. In the bank A we obtain a continuous compound rate of 8% and in the bank B we are paid a continuous compound rate of 5%. We initially deposit 6000 euros in the bank A and 11 000 in B. How long time is it necessary until the money in both accounts is exactly the same?

Remark: To obtain a correct answer it is necessary to work with at least 5 decimal digits.

1) In **1.***** years.

2) In **0.***** years.

3) In **3.***** years.

4) In **5.***** years.

5) In **8.***** years.

Exercise 2

Certain parcel of land is devalued from an initial value of 318 000 euros until a final value of 119 000 euros along 7 years. Determine the rate of continuous compound interes for that devaluation.

Remark: To obtain a correct answer it is necessary to work with at least 5 decimal digits.

1) The interest rate is **0.*****%.

2) The interest rate is **5.*****%.

3) The interest rate is **6.*****%.

4) The interest rate is **4.*****%.

5) The interest rate is **8.*****%.

Exercise 3

We have a bank account that initially offers a periodic compound interes rate of 10% in 4 periods (compounding frequency), and after 4 years the conditions are modified and then we obtain a continuous compound rate of 6%. The initial deposit is 11 000 euros. Compute the amount of money in the account after 6 years from the moment of the first deposit.

1) We will have ****2.***** euros.

2) We will have ****5.***** euros.

3) We will have ****8.***** euros.

4) We will have ****1.***** euros.

5) We will have ****3.***** euros.

Exercise 4

A firm sells Q tons of certain product. The price received per ton is given by the formula P=40000−12Q. On the other hand, the production cost per ton is C=20000+9Q. In addition, the transportation cost is 18068 per ton. Compute the maximum profit that can be obtained selling this product.

1) Profit=24 164.

2) Profit=23 938.

3) Profit=44 436.

4) Profit=36 812.

5) Profit=21 527.

Exercise 5

Deposits in certain investment account vary from year to year alternating gains and looses periods. We have the following data about the deposits for different years:

year	deposits
2	43
4	79
5	94

By means of a interpolation polynomial, obtain the function that yields the deposits in the account for every year t. Employ that function to determine the maximum funds available in the investment account.

1) The maximum for the depositis in the account was 12.

2) The maximum for the depositis in the account was 143.

3) The maximum for the depositis in the account was 2.

4) The maximum for the depositis in the account was 0.

5) The maximum for the depositis in the account was 118.

Exercise 6

The funds of a public institution alternate periods of deficit and surplus.
We have the following information for several years (in millions of euros):

year	funds
2	10
5	37
9	101

Employ an interpolation polynomial to build a function that yields the funds for each year t. We know that due to the legislation the funds of such an institution have to be kept between -8 and 50 . Compute (by means of the polynomial obtained before by interpolation) the periods along which the funds are between the indicated limits inside the interval of time where we have information (that is to say, from t=2 to t=9).

1) The funds are inside the limits for the inverval: [0,6].

2) The funds are inside the limits for the inverval: [6,9].

3) The funds are inside the limits for the inverval: [9,9].

4) The funds are inside the limits for the inverval: [-8,9].

5) The funds are inside the limits for the inverval: [2,6].

6) The funds are inside the limits for the inverval: [-2,3].

7) The funds are inside the limits for the inverval: [-2,8].

8) The funds are inside the limits for the inverval: [0,9].

Exercise 7

Se realiza un estudio para analizar la población de cierto tipo de roedores en una comarca entre los años t=1 y t=8. En ese período la población viene dada por la función $P(t) = 2 + 288\,t - 60\,t^2 + 4\,t^3$ (en miles de roedores). Determinar durante qué años el número de miles de roedores se sitúa entre 450 y 882.

1) Along the interval of years: [3.4419,5.].

2) Along the interval of years: [7,8].

3) Along the interval of years: [4.,8.].

4) Along the intervals of years: [1,7] and [8,8].

5) Along the intervals of years: [4,4] and [7,8].

6) Along the intervals of years: [1.,4.] and [7.12818,8.].

7) Along the interval of years: [1.7074,6.].

8) Along the interval of years: [1.,8.].

Exercise 8

Compute the limit: $\lim_{x\to\infty} \frac{-7-3x+4x^2}{-2+3x+2x^2+4x^3}$

1) $-\frac{1}{2}$

2) $-\frac{3}{2}$

3) 0

4) 1

5) $-\frac{3}{5}$

6) $-\infty$

7) ∞

Exercise 9

A factory produces certain type of devices. The marginal cost (cost of producing one unit) decreases when we produce a large amount of units and it is given by the function $C(x) = \frac{7+3x+2x^2+7x^3}{5+6x+7x^2+9x^3}$. Determine the expected cost per unit when a large amount of units is produced.

1) $-\infty$

2) $\frac{7}{9}$

3) 7000

4) -1

5) $\frac{4}{5}$

6) ∞

7) 0

Exercise 10

The population in certain turistic area increases exponentially and is given by the function $P(t)=77\,000\, e^{t/100}$ that indicates the number of resident citizens for every year t. At the same time, depending on the season, the city receives a variable number of tourists given by the trigonometric function $I(t)=4000+2000\,\mathrm{Sin}\left[\frac{t}{2\pi}\right]$ that yields the amount of visitors in the area for every moment t (t in years). Determine how many years are necessary until the total nomber of habitants is 110000. (the solution can be found for t between 30 and 35).

1) t=**.0****

2) t=**.2****

3) t=**.4****

4) t=**.6****

5) t=**.8****

Exercise 11

Study the continuity of the function $f(x)=\begin{cases} 0 & x \leq 0 \\ -e^x+2\sin(x)+e^2+1-2\sin(2) & 0<x<2 \\ e^{x-2}+2\sin(2-x) & 2 \leq x \end{cases}$

1) The functions is continuous for all points.

2) The functions is not continuous at any point.

3) The function is continuous for all the points except for x=0.

4) The function is continuous for all the points except for x=2.

5) The function is continuous for all the points except for x=0 and x=2.

Mathematics 1 - ADE/FyCo - 2020/2021
List of exercises 01-Functions for identity number: 26256869

Exercise 1

We have two bank accounts, the first in the bank A and the second in the bank B. In the bank A we obtain a periodic compound interes rate of 6% in 12 periods (compounding frequency) and in the bank B we are paid a continuous compound rate of 10% . We initially deposit 12 000 euros in the bank A and 2000 in B. How long time is it necessary until the money in both accounts is exactly the same?

Remark: To obtain a correct answer it is necessary to work with at least 5 decimal digits.

1) In **3.***** years.

2) In **4.***** years.

3) In **0.***** years.

4) In **9.***** years.

5) In **7.***** years.

Exercise 2

We have one bank account that offers a continuous compound rate of 6% where we initially deposit 9000 euros. How long time is it necessary until the amount of money in the account reaches 11 000 euros?

Remark: To obtain a correct answer it is necessary to work with at least 5 decimal digits.

1) In **3.***** years.

2) In **6.***** years.

3) In **4.***** years.

4) In **0.***** years.

5) In **7.***** years.

Exercise 3

We have a bank account that initially offers a periodic compound interes rate of 7% in 6 periods (compounding frequency), and after 2 years the conditions are modified and then we obtain a compound interes rate of 1% . The initial deposit is 12 000 euros. Compute the amount of money in the account after 9 years from the moment of the first deposit.

1) We will have ****2.***** euros.

2) We will have ****7.***** euros.

3) We will have ****0.***** euros.

4) We will have ****4.***** euros.

5) We will have ****9.***** euros.

Exercise 4

A firm sells Q tons of certain product. The price received per ton is given by the formula P=10000-17Q. On the other hand, the production cost per ton is C=5000+Q. In addition, the transportation cost is 4028 per ton. Compute the maximum profit that can be obtained selling this product.

1) Profit=13 122.

2) Profit=20 691.

3) Profit=5960.

4) Profit=16 161.

5) Profit=14 257.

Exercise 5

Deposits in certain investment account vary from year to year alternating gains and looses periods. We have the following data about the deposits for different years:

year	deposits
1	2
2	-2
4	-22

By means of a interpolation polynomial, obtain the function that yields the deposits in the account for every year t. Employ that function to forecast the exact amount for year 5.

1) The depositis in the account for year 5 are -38.

2) The depositis in the account for year 5 are -3.

3) The depositis in the account for year 5 are -17.

4) The depositis in the account for year 5 are -58.

5) The depositis in the account for year 5 are -2.

Exercise 6

The funds of a public institution alternate periods of deficit and surplus. We have the following information for several years (in millions of euros):

year	funds
1	6
5	−18
9	54

Employ an interpolation polynomial to build a function that yields the funds for each year t. We know that due to the legislation the funds of such an institution have to be kept between −18 and 27. Compute (by means of the polynomial obtained before by interpolation) the periods along which the funds are between the indicated limits inside the interval of time where we have information (that is to say, from t=1 to t=9).

1) The funds are inside the limits for the intervals: [1,3] y [5,8].

2) The funds are inside the limits for the inverval: [0,0].

3) The funds are inside the limits for the inverval: [0,3].

4) The funds are inside the limits for the inverval: [5,9].

5) The funds are inside the limits for the inverval: [0,9].

6) The funds are inside the limits for the inverval: [0,5].

7) The funds are inside the limits for the intervals: [0,3] y [8,9].

8) The funds are inside the limits for the intervals: [0,3] y [5,8].

Exercise 7

The population of a city is studied between years t=3 and t=10. In that period the population is given by the function $P(t)=4+336t-66t^2+4t^3$. Determine the intervals of years when the population is between 508 and 534.

1) Along the interval of years: [7.32007,9.].

2) Along the intervals of years: [3,3], [3.18826,5], [6,7.81174] and [8.31174,10].

3) Along the intervals of years: [3.,4.42823] and [9.54515,10.].

4) Along the intervals of years: [4.36416,6.06467] and [7.1797,10.7605].

5) Along the intervals of years: [3.,4.13316] and [5.,10.].

6) Along the interval of years: [6.,9.20615].

7) Along the interval of years: [6.,9.4015].

8) Along the intervals of years: [3,3.18826], [5,6] and [7.81174,8.31174].

Exercise 8

Compute the limit: $\lim_{x\to-\infty}\left(\frac{-8+9x-9x^2-4x^3}{-1+9x-5x^2-4x^3}\right)^{-1+8x}$

1) 0

2) $\frac{1}{e^5}$

3) $-\infty$

4) $\frac{1}{e}$

5) ∞

6) e^8

7) 1

Exercise 9

From an initial deposit 7000, the interest rate varies every year in such a way that the total amount of money in the account is given by the function $C(t) = 7000\left(\frac{2-4t-5t^2+5t^3}{6+4t-5t^2+5t^3}\right)^{-1+6t}$. Determine the future tendency for the deposits that we will have after a large number of years.

1) $-\infty$

2) ∞

3) $7000\,e^3$

4) $7000\,e^2$

5) 7000

6) 0

7) $\frac{7000}{e^3}$

Exercise 10

We deposit 20000 euros in a bank account with a compound interes rate of 7%. At the same time every year we also add in a safe-deposit box (therefore with no interest rate) 1000 euros. How long time is it necessary until the total ammount of money (jointly in the bank account and safe-depsit box) is 64000 euros? (the solution can be found for t between 9 and 14).

1) t=**.0****

2) t=**.2****

3) t=**.4****

4) t=**.6****

5) t=**.8****

Exercise 11

Study the continuity of the function f(x) =

$$\begin{cases} -2\sin(2-x) - \cos(2-x) & x \le 2 \\ -\sin(2-x) + 2\cos(2-x) - \sin(3) - 2\cos(3) & 2 < x < 5 \\ \log(x-4) & 5 \le x \end{cases}$$

1) The functions is continuous for all points.

2) The functions is not continuous at any point.

3) The function is continuous for all the points except for x=2.

4) The function is continuous for all the points except for x=5.

5) The function is continuous for all the points except for x=2 and x=5.

Mathematics 1 - ADE/FyCo - 2020/2021
List of exercises 01-Functions for identity number: 26523012

Exercise 1

We have two bank accounts, the first in the bank A and the second in the bank B. In the bank A we obtain a compound interes rate of 9% and in the bank B we are paid a periodic compound interes rate of 1% in 3 periods (compounding frequency). We initially deposit 3000 euros in the bank A and 9000 in B. How long time is it necessary until the money in both accounts is exactly the same?

Remark: To obtain a correct answer it is necessary to work with at least 5 decimal digits.

1) In **1.***** years.

2) In **5.***** years.

3) In **7.***** years.

4) In **4.***** years.

5) In **0.***** years.

Exercise 2

We have one bank account that offers a continuous compound rate of 2% where we initially deposit 13 000 euros. How long time is it necessary until the amount of money in the account reaches 22 000 euros?

Remark: To obtain a correct answer it is necessary to work with at least 5 decimal digits.

1) In **6.***** years.

2) In **2.***** years.

3) In **5.***** years.

4) In **7.***** years.

5) In **0.***** years.

Exercise 3

We have a bank account that initially offers a compound interes rate of 2%, and after 3 years the conditions are modified and then we obtain a periodic compound interes rate of 8% in 2 periods (compounding frequency). The initial deposit is 9000 euros. Compute the amount of money in the account after 4 years from the moment of the first deposit.

1) We will have ****5.***** euros.

2) We will have ****0.***** euros.

3) We will have ****1.***** euros.

4) We will have ****7.***** euros.

5) We will have ****8.***** euros.

Exercise 4

A firm sells Q tons of certain product. The price received per ton is given by the formula P=100000-10Q. On the other hand, the production cost per ton is C=70000+13Q. In addition, the transportation cost is 27838 per ton. Compute the maximum profit that can be obtained selling this product.

1) Profit=31 299.

2) Profit=55 305.

3) Profit=72 096.

4) Profit=50 807.

5) Profit=42 241.

Exercise 5

Deposits in certain investment account vary from year to year alternating gains and looses periods. We have the following data about the deposits for different years:

year	deposits
2	-7
3	-21
5	-67

By means of a interpolation polynomial, obtain the function that yields the deposits in the account for every year t. Employ that function to forecast the exact amount for year 6.

1) The depositis in the account for year 6 are -1.

2) The depositis in the account for year 6 are -99.

3) The depositis in the account for year 6 are -137.

4) The depositis in the account for year 6 are 1.

5) The depositis in the account for year 6 are 14.

Exercise 6

The funds of a public institution alternate periods of deficit and surplus.
We have the following information for several years (in millions of euros):

year	funds
1	21
3	29
5	29

Employ an interpolation polynomial to build a function that yields the funds for each year t. We know that due to the legislation the funds of such an institution have to be kept between 21 and 26 . Compute (by means of the polynomial obtained before by interpolation) the periods along which the funds are between the indicated limits inside the interval of time where we have information (that is to say, from t=1 to t=5).

1) The funds are inside the limits for the inverval: [1,2].

2) The funds are inside the limits for the inverval: [0,7].

3) The funds are inside the limits for the inverval: [2,5].

4) The funds are inside the limits for the inverval: [0,2].

5) The funds are inside the limits for the intervals: [0,1] y [6,7].

6) The funds are inside the limits for the intervals: [1,2] y [5,6].

7) The funds are inside the limits for the inverval: [2,7].

8) The funds are inside the limits for the inverval: [5,7].

Exercise 7

Se realiza un estudio para analizar la población de cierto tipo de roedores en una comarca entre los años t=2 y t=7. En ese período la población viene dada por la función $P(t) = 3 + 240\,t - 54\,t^2 + 4\,t^3$ (en miles de roedores). Determinar durante qué años el número de miles de roedores se sitúa entre 345 y 705.

1) Along the interval of years: [4.,6.10247].

2) Along the interval of years: [2.67113,4.08912].

3) Along the interval of years: [2.67566,3.].

4) Along the intervals of years: [2.,4.63834] and [6.10979,7.62802].

5) Along the interval of years: [3,7].

6) Along the interval of years: [2.,3.10513].

7) Along the interval of years: [5.67148,6.4027].

8) Along the intervals of years: [2,3] and [7,7].

Exercise 8

Compute the limit: $\lim_{x\to\infty} \frac{-7 - x - 3 x^2 + x^3}{-2 + 3 x - 8 x^2}$

1) $-\frac{1}{2}$

2) 1

3) 0

4) $-\infty$

5) -1

6) $-\frac{3}{8}$

7) ∞

Exercise 9

The population of certain country (in millions of habitants) is given by the function $P(t) = 38 \left(\frac{4 + 7 t + 3 t^2 - 7 t^3}{3 - 3 t + t^2 - 7 t^3}\right)^{-2+9 t}$. Determine the future tendency for this population.

1) $-\infty$

2) 38

3) $\frac{38}{e^5}$

4) ∞

5) 0

6) $\frac{38}{e^{18/7}}$

7) $\frac{38}{e^{2573/1000}}$

Exercise 10

We deposit 17000 euros in a bank account with a periodic compound interes rate of 8% in 3 periods (compounding frequency). At the same time every year we also add in a safe-deposit box (therefore with no interest rate) 3000 euros. How long time is it necessary until the total ammount of money (jointly in the bank account and safe-depsit box) is 63000 euros? (the solution can be found for t between 8 and 13).

1) t=**.0****

2) t=**.2****

3) t=**.4****

4) t=**.6****

5) t=**.8****

Exercise 11

Study the continuity of the function f(x) =

$$\begin{cases} -3\sin(1-x) - 2\cos(1-x) & x \le 1 \\ -\sin(1-x) + 2\cos(1-x) - 2 - \sin(2) - 2\cos(2) & 1 < x < 3 \\ -2\,e^{x-3} & 3 \le x \end{cases}$$

1) The functions is continuous for all points.

2) The functions is not continuous at any point.

3) The function is continuous for all the points except for x=1.

4) The function is continuous for all the points except for x=3.

5) The function is continuous for all the points except for x=1 and x=3.

Mathematics 1 - ADE/FyCo - 2020/2021
List of exercises 01-Functions for identity number: 48143225

Exercise 1

We have two bank accounts, the first in the bank A and the second in the bank B. In the bank A we obtain a compound interes rate of 5% and in the bank B we are paid a compound interes rate of 10%. We initially deposit 10 000 euros in the bank A and 2000 in B. How long time is it necessary until the money in both accounts is exactly the same?

Remark: To obtain a correct answer it is necessary to work with at least 5 decimal digits.

1) In **7.***** years.

2) In **0.***** years.

3) In **4.***** years.

4) In **2.***** years.

5) In **8.***** years.

Exercise 2

We have one bank account that offers a continuous compound rate of 1% where we initially deposit 5000 euros. How long time is it necessary until the amount of money in the account reaches 7000 euros?

Remark: To obtain a correct answer it is necessary to work with at least 5 decimal digits.

1) In **3.***** years.

2) In **8.***** years.

3) In **0.***** years.

4) In **2.***** years.

5) In **9.***** years.

Exercise 3

We have a bank account that initially offers a periodic compound interes rate of 9% in 10 periods (compounding frequency), and after 1 year the conditions are modified and then we obtain a compound interes rate of 7%. The initial deposit is 10 000 euros. Compute the amount of money in the account after 4 years from the moment of the first deposit.

1) We will have ****3.***** euros.

2) We will have ****0.***** euros.

3) We will have ****8.***** euros.

4) We will have ****2.***** euros.

5) We will have ****6.***** euros.

Exercise 4

A firm sells Q tons of certain product. The price received per ton is given by the formula P=40000-13Q. On the other hand, the production cost per ton is C=10000+19Q. In addition, the transportation cost is 27888 per ton. Compute the maximum profit that can be obtained selling this product.

1) Profit=57 036.

2) Profit=22 259.

3) Profit=56 907.

4) Profit=34 848.

5) Profit=32 299.

Exercise 5

Deposits in certain investment account vary from year to year alternating gains and looses periods. We have the following data about the deposits for different years:

year	deposits
0	0
1	3
2	8

By means of a interpolation polynomial, obtain the function that yields the deposits in the account for every year t. Employ that function to forecast the exact amount for year 3.

1) The depositis in the account for year 3 are 24.

2) The depositis in the account for year 3 are 15.

3) The depositis in the account for year 3 are -12.

4) The depositis in the account for year 3 are -2.

5) The depositis in the account for year 3 are -1.

Exercise 6

The funds of a public institution alternate periods of deficit and surplus.
We have the following information for several years (in millions of euros):

year	funds
1	-1
4	-28
8	-36

Employ an interpolation polynomial to build a function that yields the funds for each year t. We know that due to the legislation the funds of such an institution have to be kept between -33 and 30. Compute (by means of the polynomial obtained before by interpolation) the periods along which the funds are between the indicated limits inside the interval of time where we have information (that is to say, from t=1 to t=8).

1) The funds are inside the limits for the inverval: [1,5].

2) The funds are inside the limits for the inverval: [-2,8].

3) The funds are inside the limits for the inverval: [0,8].

4) The funds are inside the limits for the inverval: [8,9].

5) The funds are inside the limits for the inverval: [8,8].

6) The funds are inside the limits for the inverval: [-2,3].

7) The funds are inside the limits for the inverval: [5,8].

8) The funds are inside the limits for the inverval: [0,9].

Exercise 7

Se realiza un estudio para analizar la población de cierto tipo de roedores en una comarca entre los años t=2 y t=10. En ese período la población viene dada por la función $P(t) = 504\,t - 78\,t^2 + 4\,t^3$ (en miles de roedores). Determinar durante qué años el número de miles de roedores se sitúa entre 728 y 1430.

1) Along the interval of years: [3.38071,5.].

2) Along the interval of years: [4.60502,6.].

3) Along the interval of years: [2.73769,4.74883].

4) Along the intervals of years: [4.,6.07861] and [7.01995,9.14129].

5) Along the intervals of years: [3.59849,4.] and [5.,6.76788].

6) Along the interval of years: [2,10].

7) Along the interval of years: [5.48692,10.].

8) Along the intervals of years: [2,2] and [10,10].

Exercise 8

Compute the limit: $\lim_{x\to-\infty}\left(\frac{-9+x+3x^2}{3-x+3x^2}\right)^{2+5x+9x^2}$

1) ∞

2) $\frac{1}{e^3}$

3) 1

4) $-\infty$

5) $\frac{1}{e^4}$

6) 0

7) $\frac{1}{e^2}$

Exercise 9

A factory produces certain type of devices. The marginal cost (cost of producing one unit) decreases when we produce a large amount of units and it is given by the function $C(x)=\frac{7+9x+8x^2+2x^3+8x^4}{7+6x+5x^2+2x^3+9x^4}$. Determine the expected cost per unit when a large amount of units is produced.

1) $\frac{8}{9}$

2) 13 000

3) 0

4) ∞

5) -3

6) $-\infty$

7) $\frac{89}{100}$

Exercise 10

General: $\frac{1}{5^{749.}}$ is too small to represent as a normalized machine number; precision may be lost.

General: $\frac{1}{32^{375.}}$ is too small to represent as a normalized machine number; precision may be lost.

We deposit 4000 euros in a bank account with a periodic compound interes rate of 1% in 8 periods (compounding frequency). At the same time every year we also add in a safe-deposit box (therefore with no interest rate) 1000 euros. How long time is it necessary until the total ammount of money (jointly in the bank account and safe-depsit box) is 47000 euros? (the solution can be found for t between 44 and 49).

1) t=**.0****

2) t=**.2****

3) t=**.4****

4) t=**.6****

5) t=**.8****

Exercise 11

Study the continuity of the function $f(x)=\begin{cases} 2\sin(2-x)+2\cos(2-x) & x\leq 2 \\ 2-\log(x-1) & 2<x<3 \\ -3\log(x-2) & 3\leq x \end{cases}$

1) The functions is continuous for all points.

2) The functions is not continuous at any point.

3) The function is continuous for all the points except for x=2.

4) The function is continuous for all the points except for x=3.

5) The function is continuous for all the points except for x=2 and x=3.

Mathematics 1 - ADE/FyCo - 2020/2021
List of exercises 01-Functions for identity number: 53956072

Exercise 1

We have two bank accounts, the first in the bank A and the second in the bank B. In the bank A we obtain a compound interes rate of 7% and in the bank B we are paid a compound interes rate of 3%. We initially deposit 3000 euros in the bank A and 15 000 in B. How long time is it necessary until the money in both accounts is exactly the same?

Remark: To obtain a correct answer it is necessary to work with at least 5 decimal digits.

1) In **2.***** years.

2) In **0.***** years.

3) In **7.***** years.

4) In **6.***** years.

5) In **5.***** years.

Exercise 2

Certain parcel of land is revalued from an initial value of 251 000 euros until a final value of 403 000 euros along 5 years. Determine the rate of continuous compound interes for that revaluation.

Remark: To obtain a correct answer it is necessary to work with at least 5 decimal digits.

1) The interest rate is **5.*****%.

2) The interest rate is **9.*****%.

3) The interest rate is **8.*****%.

4) The interest rate is **7.*****%.

5) The interest rate is **1.*****%.

Exercise 3

We have a bank account that initially offers a compound interes rate of 6%, and after 2 years the conditions are modified and then we obtain a compound interes rate of 5%. The initial deposit is 15 000 euros. Compute the amount of money in the account after 3 years from the moment of the first deposit.

1) We will have ****5.***** euros.

2) We will have ****0.***** euros.

3) We will have ****7.***** euros.

4) We will have ****6.***** euros.

5) We will have ****2.***** euros.

Exercise 4

A firm sells Q tons of certain product. The price received per ton is given by the formula P=3000-4Q. On the other hand, the production cost per ton is C=1000+16Q. In addition, the transportation cost is 1480 per ton. Compute the maximum profit that can be obtained selling this product.

1) Profit=4120.

2) Profit=3380.

3) Profit=2892.

4) Profit=1726.

5) Profit=4498.

Exercise 5

Deposits in certain investment account vary from year to year alternating gains and looses periods. We have the following data about the deposits for different years:

year	deposits
0	9
2	17
3	18

By means of a interpolation polynomial, obtain the function that yields the deposits in the account for every year t. Employ that function to determine the maximum funds available in the investment account.

1) The maximum for the depositis in the account was 3.

2) The maximum for the depositis in the account was -9.

3) The maximum for the depositis in the account was 0.

4) The maximum for the depositis in the account was 18.

5) The maximum for the depositis in the account was 14.

Exercise 6

The funds of a public institution alternate periods of deficit and surplus. We have the following information for several years (in millions of euros):

year	funds
2	−34
6	−58
9	−13

Employ an interpolation polynomial to build a function that yields the funds for each year t. We know that due to the legislation the funds of such an institution have to be kept between −58 and −34. Compute (by means of the polynomial obtained before by interpolation) the periods along which the funds are between the indicated limits inside the interval of time where we have information (that is to say, from t=2 to t=9).

1) The funds are inside the limits for the inverval: [2,4].

2) The funds are inside the limits for the intervals: [0,4] y [6,8].

3) The funds are inside the limits for the inverval: [2,9].

4) The funds are inside the limits for the inverval: [6,9].

5) The funds are inside the limits for the intervals: [2,4] y [6,8].

6) The funds are inside the limits for the inverval: [0,2].

7) The funds are inside the limits for the inverval: [2,6].

8) The funds are inside the limits for the inverval: [0,6].

Exercise 7

The population of a city is studied between years t=1 and t=8. In that period the population is given by the function $P(t)=4+288\,t-60\,t^2+4\,t^3$. Determine the intervals of years when the population is between 236 and 652.

1) Along the intervals of years: [2.76354,5.] and [6.,8.].

2) Along the interval of years: [1.66071,2.].

3) Along the intervals of years: [1,1] and [8,8].

4) Along the interval of years: [1,8].

5) Along the interval of years: [1.,8.].

6) Along the interval of years: [6.28125,8.79486].

7) Along the interval of years: [1.,8.4033].

8) Along the interval of years: [1.,8.].

Exercise 8

Compute the limit: $\lim_{x\to\infty} \frac{-7+8x+x^2}{6+3x-x^2-8x^3}$

1) $\frac{1}{7}$

2) ∞

3) 0

4) 1

5) $-\infty$

6) -1

7) $-\frac{1}{3}$

Exercise 9

From an initial deposit 16000, the interest rate varies every year in such a way that the total amount of money in the account is given by the function $C(t) = 16\,000 \left(\frac{3-6t-3t^2}{-8+3t-3t^2}\right)^{-6+8t}$. Determine the future tendency for the deposits that we will have after a large number of years.

1) 0

2) $16\,000$

3) $-\infty$

4) $\frac{16\,000}{e^5}$

5) ∞

6) $16\,000\, e^{24}$

7) $\frac{16\,000}{e^4}$

Exercise 10

The population in certain turistic area increases exponentially and is given by the function $P(t)=68\,000\, e^{t/50}$ that indicates the number of resident citizens for every year t. At the same time, depending on the season, the city receives a variable number of tourists given by the trigonometric function $I(t)=5000+1000\,\text{Sin}\left[\frac{t}{2\pi}\right]$ that yields the amount of visitors in the area for every moment t (t in years). Determine how many years are necessary until the total nomber of habitants is 101000. (the solution can be found for t between 13 and 18).

1) t=**.0****

2) t=**.2****

3) t=**.4****

4) t=**.6****

5) t=**.8****

Exercise 11

Study the continuity of the function f(x) =

$$\begin{cases} -2\, e^{x+1}-\sin(x+1) & x\le -1 \\ 2\sin(x+1)-2\cos(x+1)-1-2\sin(1)+2\cos(1) & -1<x<0 \\ \log(x+1)-1 & 0\le x \end{cases}$$

1) The functions is continuous for all points.

2) The functions is not continuous at any point.

3) The function is continuous for all the points except for x=-1.

4) The function is continuous for all the points except for x=0.

5) The function is continuous for all the points except for x=-1 and x=0.

Mathematics 1 - ADE/FyCo - 2020/2021
List of exercises 01-Functions for identity number: 74540350

Exercise 1

We have two bank accounts, the first in the bank A and the second in the bank B. In the bank A we obtain a compound interes rate of 2% and in the bank B we are paid a compound interes rate of 9%. We initially deposit 8000 euros in the bank A and 1000 in B. How long time is it necessary until the money in both accounts is exactly the same?

Remark: To obtain a correct answer it is necessary to work with at least 5 decimal digits.

1) In **8.***** years.

2) In **3.***** years.

3) In **6.***** years.

4) In **0.***** years.

5) In **1.***** years.

Exercise 2

We have one bank account that offers a periodic compound interes rate of 3% in 10 periods (compounding frequency) where we initially deposit 11000 euros. How long time is it necessary until the amount of money in the account reaches 15000 euros?

Remark: To obtain a correct answer it is necessary to work with at least 5 decimal digits.

1) In **6.***** years.

2) In **1.***** years.

3) In **8.***** years.

4) In **0.***** years.

5) In **4.***** years.

Exercise 3

We have a bank account that initially offers a periodic compound interes rate of 3% in 5 periods (compounding frequency), and after 1 year the conditions are modified and then we obtain a periodic compound interes rate of 8% in 11 periods (compounding frequency). The initial deposit is 8000 euros. Compute the amount of money in the account after 2 years from the moment of the first deposit.

1) We will have ****6.***** euros.

2) We will have ****8.***** euros.

3) We will have ****2.***** euros.

4) We will have ****7.***** euros.

5) We will have ****3.***** euros.

Exercise 4

A firm sells Q tons of certain product. The price received per ton is given by the formula P=2000−8Q. On the other hand, the production cost per ton is C=1000+11Q. In addition, the transportation cost is 506 per ton. Compute the maximum profit that can be obtained selling this product.

1) Profit=1276.

2) Profit=3211.

3) Profit=980.

4) Profit=2527.

5) Profit=3888.

Exercise 5

Deposits in certain investment account vary from year to year alternating gains and looses periods. We have the following data about the deposits for different years:

year	deposits
2	−8
3	−18
5	−50

By means of a interpolation polynomial, obtain the function that yields the deposits in the account for every year t. Employ that function to forecast the exact amount for year 7.

1) The depositis in the account for year 7 are 2.

2) The depositis in the account for year 7 are 12.

3) The depositis in the account for year 7 are −2.

4) The depositis in the account for year 7 are −98.

5) The depositis in the account for year 7 are −128.

Exercise 6

The funds of a public institution alternate periods of deficit and surplus. We have the following information for several years (in millions of euros):

year	funds
0	11
2	-1
6	-1

Employ an interpolation polynomial to build a function that yields the funds for each year t. We know that due to the legislation the funds of such an institution have to be kept between -4 and 4. Compute (by means of the polynomial obtained before by interpolation) the periods along which the funds are between the indicated limits inside the interval of time where we have information (that is to say, from t=0 to t=6).

1) The funds are inside the limits for the inverval: [1,5].

2) The funds are inside the limits for the intervals: [0,3] y [5,7].

3) The funds are inside the limits for the inverval: [1,3].

4) The funds are inside the limits for the intervals: [1,3] y [5,6].

5) The funds are inside the limits for the inverval: [0,1].

6) The funds are inside the limits for the inverval: [1,6].

7) The funds are inside the limits for the inverval: [0,5].

8) The funds are inside the limits for the inverval: [5,6].

Exercise 7

The population of a city is studied between years t=1 and t=9. In that period the population is given by the function $P(t)=4+144\,t-48\,t^2+4\,t^3$. Determine the intervals of years when the population is between 24 and 68.

1) Along the intervals of years: [4,5] and [6.8541,7.4641].

2) Along the intervals of years: [2.,4.28225] and [6.09574,7.].

3) Along the interval of years: [2.,9.39923].

4) Along the interval of years: [4.,5.54431].

5) Along the intervals of years: [1.30633,2.] and [3.10058,4.38089].

6) Along the intervals of years: [1.,2.] and [4.,5.].

7) Along the interval of years: [3.,6.].

8) Along the intervals of years: [1,4], [5,6.8541] and [7.4641,9].

Exercise 8

Compute the limit: $\lim_{x\to-\infty}\left(\frac{9-8x-6x^2}{-8-2x-6x^2}\right)^{3+6x+3x^2}$

1) 1

2) e

3) $\frac{1}{e}$

4) $\frac{1}{e^4}$

5) 0

6) ∞

7) $-\infty$

Exercise 9

From an initial deposit 19000, the interest rate varies every year in such a way that the total amount of money in the account is given by the function $C(t) = 19000\left(\frac{-6-3t-4t^2-2t^3}{8+8t+6t^2-2t^3}\right)^{3+6t}$. Determine the future tendency for the deposits that we will have after a large number of years.

1) $-\infty$

2) $19000\, e^{30}$

3) 0

4) $19000\, e^{14999/500}$

5) ∞

6) $\frac{19000}{e^5}$

7) 19000

Exercise 10

We deposit 13000 euros in a bank account with a compound interes rate of 10%. At the same time every year we also add in a safe-deposit box (therefore with no interest rate) 2000 euros. How long time is it necessary until the total ammount of money (jointly in the bank account and safe-depsit box) is 51000 euros?
(the solution can be found for t between 7 and 12).

1) t=**.0****

2) t=**.2****

3) t=**.4****

4) t=**.6****

5) t=**.8****

Exercise 11

Study the continuity of the function $f(x) = \begin{cases} -2\sin(x) - \cos(x) & x \leq 0 \\ -2x & 0 < x < 1 \\ 2\sin(1-x) - 2\cos(1-x) & 1 \leq x \end{cases}$

1) The functions is continuous for all points.

2) The functions is not continuous at any point.

3) The function is continuous for all the points except for x=0.

4) The function is continuous for all the points except for x=1.

5) The function is continuous for all the points except for x=0 and x=1.

Mathematics 1 - ADE/FyCo - 2020/2021
List of exercises 01-Functions for identity number: 75573701

Exercise 1

We have two bank accounts, the first in the bank A and the second in the bank B. In the bank A we obtain a compound interes rate of 8% and in the bank B we are paid a continuous compound rate of 3%. We initially deposit 7000 euros in the bank A and 12 000 in B. How long time is it necessary until the money in both accounts is exactly the same?

Remark: To obtain a correct answer it is necessary to work with at least 5 decimal digits.

1) In **1.***** years.

2) In **5.***** years.

3) In **2.***** years.

4) In **0.***** years.

5) In **8.***** years.

Exercise 2

We have one bank account that offers a compound interes rate of 3% where we initially deposit 11 000 euros. How long time is it necessary until the amount of money in the account reaches 20 000 euros?

Remark: To obtain a correct answer it is necessary to work with at least 5 decimal digits.

1) In **0.***** years.

2) In **5.***** years.

3) In **2.***** years.

4) In **6.***** years.

5) In **8.***** years.

Exercise 3

We have a bank account that initially offers a continuous compound rate of 6%, and after 4 years the conditions are modified and then we obtain a periodic compound interes rate of 9% in 3 periods (compounding frequency). The initial deposit is 12 000 euros. Compute the amount of money in the account after 9 years from the moment of the first deposit.

1) We will have ****6.***** euros.

2) We will have ****2.***** euros.

3) We will have ****0.***** euros.

4) We will have ****5.***** euros.

5) We will have ****8.***** euros.

Exercise 4

A firm sells Q tons of certain product. The price received per ton is given by the formula P=6000-16Q. On the other hand, the production cost per ton is C=3000-9Q. In addition, the transportation cost is 2846 per ton. Compute the maximum profit that can be obtained selling this product.

1) Profit=805.

2) Profit=352.

3) Profit=847.

4) Profit=1431.

5) Profit=1060.

Exercise 5

Deposits in certain investment account vary from year to year alternating gains and looses periods. We have the following data about the deposits for different years:

year	deposits
1	5
3	27
5	73

By means of a interpolation polynomial, obtain the function that yields the deposits in the account for every year t. Employ that function to forecast the exact amount for year 6.

1) The depositis in the account for year 6 are 105.

2) The depositis in the account for year 6 are -15.

3) The depositis in the account for year 6 are 143.

4) The depositis in the account for year 6 are 7.

5) The depositis in the account for year 6 are -20.

Exercise 6

The funds of a public institution alternate periods of deficit and surplus. We have the following information for several years (in millions of euros):

year	funds
1	-15
4	-60
7	-51

Employ an interpolation polynomial to build a function that yields the funds for each year t. We know that due to the legislation the funds of such an institution have to be kept between -60 and -36. Compute (by means of the polynomial obtained before by interpolation) the periods along which the funds are between the indicated limits inside the interval of time where we have information (that is to say, from t=1 to t=7).

1) The funds are inside the limits for the inverval: [0,2].

2) The funds are inside the limits for the inverval: [0,6].

3) The funds are inside the limits for the inverval: [6,7].

4) The funds are inside the limits for the inverval: [2,7].

5) The funds are inside the limits for the inverval: [2,6].

6) The funds are inside the limits for the intervals: [0,4] y [6,8].

7) The funds are inside the limits for the intervals: [2,4] y [6,7].

8) The funds are inside the limits for the inverval: [2,4].

Exercise 7

The population of a city is studied between years t=3 and t=9. In that period the population is given by the function $P(t)=6+576\,t-84\,t^2+4\,t^3$. Determine the intervals of years when the population is between 1286 and 1502.

1) Along the intervals of years: [3.59945,6.09566] and [8.34875,9.04385].

2) Along the intervals of years: [5.,6.26036] and [8.,9.].

3) Along the interval of years: [3.61217,5.71889].

4) Along the intervals of years: [4.,5.] and [6.,7.].

5) Along the intervals of years: [4.,7.36277] and [8.,9.].

6) Along the intervals of years: [3,5], [8,8] and [9,9].

7) Along the interval of years: [5,9].

8) Along the intervals of years: [3.,5.] and [6.,9.65513].

Exercise 8

Compute the limit: $\lim_{x\to-\infty}\frac{-1-2x+8x^2}{-4+9x-8x^2+5x^3}$

1) 0

2) $-\frac{1}{4}$

3) 1

4) $-\frac{1}{7}$

5) ∞

6) -1

7) $-\infty$

Exercise 9

From an initial deposit 20000, the interest rate varies every year in such a way that the total amount of money in the account is given by the function $C(t) = 20\,000\left(\frac{-7+8t+6t^2}{3+4t+6t^2}\right)^{2+2t+7t^2}$. Determine the future tendency for the deposits that we will have after a large number of years.

1) $\frac{20\,000}{e^4}$

2) $20\,000$

3) $-\infty$

4) ∞

5) 0

6) $\frac{20\,000}{e^3}$

7) $\frac{20\,000}{e^5}$

Exercise 10

We deposit 14000 euros in a bank account with a compound interes rate of 4%. At the same time every year we also add in a safe-deposit box (therefore with no interest rate) 3000 euros. How long time is it necessary until the total ammount of money (jointly in the bank account and safe-depsit box) is 44000 euros? (the solution can be found for t between 7 and 12).

1) t=**.0****

2) t=**.2****

3) t=**.4****

4) t=**.6****

5) t=**.8****

Exercise 11

Study the continuity of the function f(x) =

$$\begin{cases} \sin(x+1) & x \le -1 \\ -\sin(x+1) - \cos(x+1) + 1 + \sin(3) + \cos(3) & -1 < x < 2 \\ e^{x-2} - \sin(2-x) & 2 \le x \end{cases}$$

1) The functions is continuous for all points.

2) The functions is not continuous at any point.

3) The function is continuous for all the points except for x=-1.

4) The function is continuous for all the points except for x=2.

5) The function is continuous for all the points except for x=-1 and x=2.

Mathematics 1 - ADE/FyCo - 2020/2021
List of exercises 01-Functions for identity number: 77379111

Exercise 1

We have two bank accounts, the first in the bank A and the second in the bank B. In the bank A we obtain a continuous compound rate of 5% and in the bank B we are paid a continuous compound rate of 10%. We initially deposit 6000 euros in the bank A and 2000 in B. How long time is it necessary until the money in both accounts is exactly the same?

Remark: To obtain a correct answer it is necessary to work with at least 5 decimal digits.

1) In **0.***** years.

2) In **2.***** years.

3) In **8.***** years.

4) In **9.***** years.

5) In **1.***** years.

Exercise 2

Certain parcel of land is revalued from an initial value of 204 000 euros until a final value of 421 000 euros along 8 years. Determine the rate of periodic compound interes in 11 periods for that revaluation.

Remark: To obtain a correct answer it is necessary to work with at least 5 decimal digits.

1) The interest rate is **9.*****%.

2) The interest rate is **2.*****%.

3) The interest rate is **3.*****%.

4) The interest rate is **5.*****%.

5) The interest rate is **0.*****%.

Exercise 3

We have a bank account that initially offers a continuous compound rate of 10%, and after 4 years the conditions are modified and then we obtain a continuous compound rate of 8%. The initial deposit is 6000 euros. Compute the amount of money in the account after 7 years from the moment of the first deposit.

1) We will have ****8.***** euros.

2) We will have ****0.***** euros.

3) We will have ****1.***** euros.

4) We will have ****2.***** euros.

5) We will have ****9.***** euros.

Exercise 4

A firm sells Q tons of certain product. The price received per ton is given by the formula P=12000-8Q. On the other hand, the production cost per ton is C=8000+3Q. In addition, the transportation cost is 3142 per ton. Compute the maximum profit that can be obtained selling this product.

1) Profit=16 731.

2) Profit=17 376.

3) Profit=9003.

4) Profit=14 270.

5) Profit=8308.

Exercise 5

Deposits in certain investment account vary from year to year alternating gains and looses periods. We have the following data about the deposits for different years:

year	deposits
1	99
3	51
4	33

By means of a interpolation polynomial, obtain the function that yields the deposits in the account for every year t. Employ that function to determine the minimum funds available in the investment account.

1) The minimum for the depositis in the account was 10.

2) The minimum for the depositis in the account was -8.

3) The minimum for the depositis in the account was 1.

4) The minimum for the depositis in the account was 3.

5) The minimum for the depositis in the account was 8.

Exercise 6

The funds of a public institution alternate periods of deficit and surplus. We have the following information for several years (in millions of euros):

year	funds
2	10
6	74
8	130

Employ an interpolation polynomial to build a function that yields the funds for each year t. We know that due to the legislation the funds of such an institution have to be kept between 20 and 154. Compute (by means of the polynomial obtained before by interpolation) the periods along which the funds are between the indicated limits inside the interval of time where we have information (that is to say, from t=2 to t=8).

1) The funds are inside the limits for the inverval: [-2,5].

2) The funds are inside the limits for the inverval: [3,8].

3) The funds are inside the limits for the inverval: [-3,8].

4) The funds are inside the limits for the inverval: [-1,3].

5) The funds are inside the limits for the inverval: [0,3].

6) The funds are inside the limits for the inverval: [-1,9].

7) The funds are inside the limits for the inverval: [0,8].

8) The funds are inside the limits for the inverval: [8,8].

Exercise 7

The population of a city is studied between years t=3 and t=9. In that period the population is given by the function $P(t)=1+240t-54t^2+4t^3$. Determine the intervals of years when the population is between 297 and 703.

1) Along the intervals of years: [4.07667,5.68259] and [6.31703,7.].

2) Along the intervals of years: [3,3] and [9,9].

3) Along the intervals of years: [3.,4.] and [5.66093,7.0293].

4) Along the intervals of years: [4.15627,6.16769] and [8.18164,9.].

5) Along the interval of years: [4.60178,9.].

6) Along the interval of years: [3.5986,9.61637].

7) Along the interval of years: [3,9].

8) Along the intervals of years: [4.,5.3593] and [8.18338,9.].

Exercise 8

Compute the limit: $\lim_{x \to -\infty} \left(\frac{-3 - 9x - 2x^2}{6 - 8x - 2x^2} \right)^{1+x}$

1) 1

2) ∞

3) $\sqrt{e}$

4) $\frac{1}{e^3}$

5) $\frac{1}{e^4}$

6) $-\infty$

7) 0

Exercise 9

From an initial deposit 7000, the interest rate varies every year in such a way that the total amount of money in the account is given by the function $C(t) = 7000 \left(\frac{2 + 7t + 3t^2 - 8t^3}{4 - 3t + 4t^2 - 8t^3} \right)^{2+4t}$. Determine the future tendency for the deposits that we will have after a large number of years.

1) ∞

2) 7000

3) $-\infty$

4) $7000\sqrt{e}$

5) $\frac{7000}{e^5}$

6) $7000\, e^{249/500}$

7) 0

Exercise 10

The population in certain turistic area increases exponentially and is given by the function $P(t) = 75\,000\, e^{t/50}$ that indicates the number of resident citizens for every year t. At the same time, depending on the season, the city receives a variable number of tourists given by the trigonometric function $I(t) = 3000 + 1000 \operatorname{Sin}\left[\frac{t}{2\pi}\right]$ that yields the amount of visitors in the area for every moment t (t in years). Determine how many years are necessary until the total nomber of habitants is 104000. (the solution can be found for t between 11 and 16).

1) t=**.1****

2) t=**.3****

3) t=**.5****

4) t=**.7****

5) t=**.9****

Exercise 11

Study the continuity of the function $f(x) = \begin{cases} -e^{x-3} & x \le 3 \\ 3\log(x-2) - 1 & 3 < x < 6 \\ 2 - 2\log(x-5) & 6 \le x \end{cases}$

1) The functions is continuous for all points.

2) The functions is not continuous at any point.

3) The function is continuous for all the points except for x=3.

4) The function is continuous for all the points except for x=6.

5) The function is continuous for all the points except for x=3 and x=6.

Mathematics 1 - ADE/FyCo - 2020/2021
List of exercises 01-Functions for identity number: 77388334

Exercise 1

We have two bank accounts, the first in the bank A and the second in the bank B. In the bank A we obtain a periodic compound interes rate of 7% in 10 periods (compounding frequency) and in the bank B we are paid a compound interes rate of 3% . We initially deposit 4000 euros in the bank A and 9000 in B. How long time is it necessary until the money in both accounts is exactly the same?

Remark: To obtain a correct answer it is necessary to work with at least 5 decimal digits.

1) In **1.***** years.

2) In **7.***** years.

3) In **3.***** years.

4) In **0.***** years.

5) In **4.***** years.

Exercise 2

Certain parcel of land is devalued from an initial value of 309 000 euros until a final value of 196 000 euros along 6 years. Determine the rate of continuous compound interes for that devaluation.

Remark: To obtain a correct answer it is necessary to work with at least 5 decimal digits.

1) The interest rate is **9.*****%.

2) The interest rate is **5.*****%.

3) The interest rate is **7.*****%.

4) The interest rate is **2.*****%.

5) The interest rate is **6.*****%.

Exercise 3

We have a bank account that initially offers a compound interes rate of 5%, and after 4 years the conditions are modified and then we obtain a compound interes rate of 7% . The initial deposit is 9000 euros. Compute the amount of money in the account after 10 years from the moment of the first deposit.

1) We will have ****8.***** euros.

2) We will have ****0.***** euros.

3) We will have ****4.***** euros.

4) We will have ****7.***** euros.

5) We will have ****9.***** euros.

Exercise 4

A firm sells Q tons of certain product. The price received per ton is given by the formula P=80000−19Q. On the other hand, the production cost per ton is C=10000+8Q. In addition, the transportation cost is 67300 per ton. Compute the maximum profit that can be obtained selling this product.

1) Profit=45 452.

2) Profit=67 500.

3) Profit=36 982.

4) Profit=30 317.

5) Profit=107 683.

Exercise 5

Deposits in certain investment account vary from year to year alternating gains and looses periods. We have the following data about the deposits for different years:

year	deposits
1	18
3	54
4	69

By means of a interpolation polynomial, obtain the function that yields the deposits in the account for every year t. Employ that function to determine the maximum funds available in the investment account.

1) The maximum for the depositis in the account was 118.

2) The maximum for the depositis in the account was −9.

3) The maximum for the depositis in the account was 11.

4) The maximum for the depositis in the account was 93.

5) The maximum for the depositis in the account was 6.

Exercise 6

The funds of a public institution alternate periods of deficit and surplus.
We have the following information for several years (in millions of euros):

year	funds
2	-14
5	-20
7	-4

Employ an interpolation polynomial to build a function that yields the funds for each year t. We know that due to the legislation the funds of such an institution have to be kept between -20 and -4
. Compute (by means of the polynomial obtained before by interpolation) the periods along which the funds are between the indicated limits inside the interval of time where we have information (that is to say, from t=2 to t=7).

1) The funds are inside the limits for the inverval: [1,3].

2) The funds are inside the limits for the inverval: [0,1].

3) The funds are inside the limits for the inverval: [1,5].

4) The funds are inside the limits for the intervals: [0,3] y [5,7].

5) The funds are inside the limits for the intervals: [2,3] y [5,7].

6) The funds are inside the limits for the inverval: [5,7].

7) The funds are inside the limits for the inverval: [1,7].

8) The funds are inside the limits for the inverval: [0,5].

Exercise 7

The deposits in certain account between the months t=0 and t=9 is given by the function $C(t)=6+60\,t-36\,t^2+4\,t^3$
. Determine the months for which the deposit is between -30 and 14 euros.

1) Along the intervals of months: [0,0.145898], [2,3] and [6.4641,6.8541].

2) Along the intervals of months: [2.,5.] and [8.,9.51862].

3) Along the interval of months: [1.25254,2.54581].

4) Along the interval of months: [1.09392,3.73298].

5) Along the interval of months: [2.,4.].

6) Along the intervals of months: [0,0], [0.145898,2], [3,6.4641] and [6.8541,9].

7) Along the interval of months: [4.,9.].

8) Along the intervals of months: [-4.45015×10^{-308},6.] and [8.,9.66988].

Exercise 8

Compute the limit: $\lim_{x\to-\infty}\left(\frac{4-2x-2x^2}{-3-6x-2x^2}\right)^{7+6x}$

1) $\frac{1}{e^4}$

2) $\frac{1}{e^5}$

3) 0

4) $-\infty$

5) 1

6) $\frac{1}{e^{12}}$

7) ∞

Exercise 9

From an initial deposit 10000, the interest rate varies every year in such a way that the total amount of money in the account is given by the function $C(t) = 10\,000\left(\frac{8-5t-6t^2+7t^3}{-9-t-5t^2+7t^3}\right)^{-9+4t}$. Determine the future tendency for the deposits that we will have after a large number of years.

1) $\frac{10\,000}{e^{571/1000}}$

2) $\frac{10\,000}{e^4}$

3) 10 000

4) 0

5) $-\infty$

6) ∞

7) $\frac{10\,000}{e^{4/7}}$

Exercise 10

The population in certain turistic area
increases exponentially and is given by the function $P(t)=76\,000\, e^{t/100}$
that indicates the number of resident citizens for every year t. At the same
time, depending on the season, the city receives a variable number of
tourists given by the trigonometric function $I(t)=3000+1000\,\mathrm{Sin}\left[\frac{t}{2\pi}\right]$
that yields the amount of visitors in the area for every moment t (t in years).
Determine how many years are necessary until the total nomber of habitants is 111000.
(the solution can be found for t between 35 and 40).

1) t=**.0****

2) t=**.2****

3) t=**.4****

4) t=**.6****

5) t=**.8****

Exercise 11

Study the continuity of the function $f(x)=\begin{cases} -e^{x}-\sin(x) & x\leq 0 \\ -x-1 & 0<x<1 \\ -3\sin(1-x)-2\cos(1-x) & 1\leq x \end{cases}$

1) The functions is continuous for all points.

2) The functions is not continuous at any point.

3) The function is continuous for all the points except for x=0.

4) The function is continuous for all the points except for x=1.

5) The function is continuous for all the points except for x=0 and x=1.

Mathematics 1 - ADE/FyCo - 2020/2021
List of exercises 01-Functions for identity number: 77434209

Exercise 1

We have two bank accounts, the first in the bank A and the second in the bank B. In the bank A we obtain a compound interes rate of 9% and in the bank B we are paid a periodic compound interes rate of 3% in 3 periods (compounding frequency). We initially deposit 3000 euros in the bank A and 15 000 in B. How long time is it necessary until the money in both accounts is exactly the same?

Remark: To obtain a correct answer it is necessary to work with at least 5 decimal digits.

1) In **0.***** years.

2) In **9.***** years.

3) In **8.***** years.

4) In **3.***** years.

5) In **1.***** years.

Exercise 2

Certain parcel of land is revalued from an initial value of 245 000 euros until a final value of 427 000 euros along 6 years. Determine the rate of continuous compound interes for that revaluation.

Remark: To obtain a correct answer it is necessary to work with at least 5 decimal digits.

1) The interest rate is **0.*****%.

2) The interest rate is **4.*****%.

3) The interest rate is **9.*****%.

4) The interest rate is **1.*****%.

5) The interest rate is **2.*****%.

Exercise 3

We have a bank account that initially offers a periodic compound interes rate of 5% in 5 periods (compounding frequency), and after 2 years the conditions are modified and then we obtain a compound interes rate of 3%. The initial deposit is 15 000 euros. Compute the amount of money in the account after 3 years from the moment of the first deposit.

1) We will have ****6.***** euros.

2) We will have ****5.***** euros.

3) We will have ****4.***** euros.

4) We will have ****9.***** euros.

5) We will have ****0.***** euros.

Exercise 4

A firm sells Q tons of certain product. The price received per ton is given by the formula P=14000-19Q. On the other hand, the production cost per ton is C=2000+7Q. In addition, the transportation cost is 11584 per ton. Compute the maximum profit that can be obtained selling this product.

1) Profit=1664.

2) Profit=1286.

3) Profit=2166.

4) Profit=2812.

5) Profit=1016.

Exercise 5

Deposits in certain investment account vary from year to year alternating gains and looses periods. We have the following data about the deposits for different years:

year	deposits
1	2
3	6
4	5

By means of a interpolation polynomial, obtain the function that yields the deposits in the account for every year t. Employ that function to determine the maximum funds available in the investment account.

1) The maximum for the depositis in the account was 3.

2) The maximum for the depositis in the account was -10.

3) The maximum for the depositis in the account was 6.

4) The maximum for the depositis in the account was -8.

5) The maximum for the depositis in the account was 18.

Exercise 6

The funds of a public institution alternate periods of deficit and surplus. We have the following information for several years (in millions of euros):

year	funds
2	75
6	99
9	54

Employ an interpolation polynomial to build a function that yields the funds for each year t. We know that due to the legislation the funds of such an institution have to be kept between 99 and 118 . Compute (by means of the polynomial obtained before by interpolation) the periods along which the funds are between the indicated limits inside the interval of time where we have information (that is to say, from t=2 to t=9).

1) The funds are inside the limits for the inverval: [0,6].

2) The funds are inside the limits for the inverval: [4,9].

3) The funds are inside the limits for the inverval: [0,9].

4) The funds are inside the limits for the inverval: [6,9].

5) The funds are inside the limits for the inverval: [9,9].

6) The funds are inside the limits for the inverval: [-2,3].

7) The funds are inside the limits for the inverval: [4,6].

8) The funds are inside the limits for the inverval: [-2,4].

Exercise 7

Se realiza un estudio para analizar la población de cierto tipo de roedores en una comarca entre los años t=1 y t=7. En ese período la población viene dada por la función $P(t) = 4 + 72t - 30t^2 + 4t^3$ (en miles de roedores). Determinar durante qué años el número de miles de roedores se sitúa entre 114 y 708.

1) Along the interval of years: [1.,5.76992].

2) Along the intervals of years: [1.66479,2.17948] and [5.6043,6.17854].

3) Along the intervals of years: [1,5] and [7,7].

4) Along the intervals of years: [2.,3.] and [4.,5.].

5) Along the intervals of years: [1.10285,2.66639] and [5.,6.].

6) Along the interval of years: [5,7].

7) Along the interval of years: [6.39603,7.33529].

8) Along the interval of years: [1.09857,3.74832].

Exercise 8

Compute the limit: $\lim_{x\to-\infty}\left(\frac{2+2x-2x^2}{3-4x-2x^2}\right)^{-5+8x}$

1) $-\infty$

2) $\frac{1}{e^{24}}$

3) $\frac{1}{e^{5}}$

4) 0

5) ∞

6) 1

7) $\frac{1}{e^{4}}$

Exercise 9

From an initial deposit 5000, the interest rate varies every year in such a way that the total amount of money in the account is given by the function $C(t) = 5000\left(\frac{-2-2t+6t^2+4t^3}{-8+4t+3t^2+4t^3}\right)^{-8-5t+2t^2}$. Determine the future tendency for the deposits that we will have after a large number of years.

1) $\frac{5000}{e^{3}}$

2) $\frac{5000}{e^{4}}$

3) $\frac{5000}{e^{2}}$

4) $-\infty$

5) ∞

6) 0

7) 5000

Exercise 10

The population in certain turistic area increases exponentially and is given by the function $P(t)=68000\, e^{t/100}$ that indicates the number of resident citizens for every year t. At the same time, depending on the season, the city receives a variable number of tourists given by the trigonometric function $I(t)=3000+1000\,\mathrm{Sin}\left[\frac{t}{2\pi}\right]$ that yields the amount of visitors in the area for every moment t (t in years). Determine how many years are necessary until the total nomber of habitants is 104000. (the solution can be found for t between 39 and 44).

1) t=**.1****

2) t=**.3****

3) t=**.5****

4) t=**.7****

5) t=**.9****

Exercise 11

Study the continuity of the function $f(x)=\begin{cases} -e^{x+1}-\sin(x+1) & x \le -1 \\ -2 & -1 < x < 1 \\ -3\sin(1-x)-2\cos(1-x) & 1 \le x \end{cases}$

1) The functions is continuous for all points.

2) The functions is not continuous at any point.

3) The function is continuous for all the points except for x=-1.

4) The function is continuous for all the points except for x=1.

5) The function is continuous for all the points except for x=-1 and x=1.

Mathematics 1 - ADE/FyCo - 2020/2021
List of exercises 01-Functions for identity number: 77435467

Exercise 1

We have two bank accounts, the first in the bank A and the second in the bank B. In the bank A we obtain a periodic compound interes rate of 5% in 12 periods (compounding frequency) and in the bank B we are paid a compound interes rate of 9%. We initially deposit 8000 euros in the bank A and 2000 in B. How long time is it necessary until the money in both accounts is exactly the same?

Remark: To obtain a correct answer it is necessary to work with at least 5 decimal digits.

1) In **2.***** years.

2) In **6.***** years.

3) In **4.***** years.

4) In **8.***** years.

5) In **0.***** years.

Exercise 2

Certain parcel of land is devalued from an initial value of 306 000 euros until a final value of 186 000 euros along 6 years. Determine the rate of periodic compound interes in 11 periods for that devaluation.

Remark: To obtain a correct answer it is necessary to work with at least 5 decimal digits.

1) The interest rate is **8.*****%.

2) The interest rate is **3.*****%.

3) The interest rate is **9.*****%.

4) The interest rate is **6.*****%.

5) The interest rate is **0.*****%.

Exercise 3

We have a bank account that initially offers a continuous compound rate of 9%, and after 4 years the conditions are modified and then we obtain a compound interes rate of 9%. The initial deposit is 8000 euros. Compute the amount of money in the account after 2 years from the moment of the first deposit.

1) We will have ****3.***** euros.

2) We will have ****6.***** euros.

3) We will have ****4.***** euros.

4) We will have ****7.***** euros.

5) We will have ****2.***** euros.

Exercise 4

A firm sells Q tons of certain product. The price received per ton is given by the formula P=14000−16Q. On the other hand, the production cost per ton is C=13000+9Q. In addition, the transportation cost is 150 per ton. Compute the maximum profit that can be obtained selling this product.

1) Profit=9380.

2) Profit=5150.

3) Profit=8819.

4) Profit=7225.

5) Profit=4854.

Exercise 5

Deposits in certain investment account vary from year to year alternating gains and looses periods. We have the following data about the deposits for different years:

year	deposits
1	26
2	43
4	71

By means of a interpolation polynomial, obtain the function that yields the deposits in the account for every year t. Employ that function to determine the maximum funds available in the investment account.

1) The maximum for the depositis in the account was 107.

2) The maximum for the depositis in the account was −5.

3) The maximum for the depositis in the account was 98.

4) The maximum for the depositis in the account was 10.

5) The maximum for the depositis in the account was 3.

Exercise 6

The funds of a public institution alternate periods of deficit and surplus. We have the following information for several years (in millions of euros):

year	funds
2	54
4	62
8	30

Employ an interpolation polynomial to build a function that yields the funds for each year t. We know that due to the legislation the funds of such an institution have to be kept between 44 and 60. Compute (by means of the polynomial obtained before by interpolation) the periods along which the funds are between the indicated limits inside the interval of time where we have information (that is to say, from t=2 to t=8).

1) The funds are inside the limits for the intervals: [0,1] y [5,7].

2) The funds are inside the limits for the intervals: [2,3] y [5,7].

3) The funds are inside the limits for the inverval: [7,8].

4) The funds are inside the limits for the inverval: [0,3].

5) The funds are inside the limits for the inverval: [0,7].

6) The funds are inside the limits for the inverval: [1,3].

7) The funds are inside the limits for the inverval: [3,7].

8) The funds are inside the limits for the inverval: [3,8].

Exercise 7

The population of a city is studied between years t=4 and t=10. In that period the population is given by the function $P(t)=8+504\,t-78\,t^2+4\,t^3$. Determine the intervals of years when the population is between 736 and 1142.

1) Along the interval of years: [4,9].

2) Along the intervals of years: [4.,8.] and [9.,10.0354].

3) Along the interval of years: [5.,7.].

4) Along the intervals of years: [4,4] and [9,10].

5) Along the interval of years: [8.06142,10.].

6) Along the intervals of years: [4.63903,5.] and [7.,9.].

7) Along the interval of years: [4.40717,5.].

8) Along the intervals of years: [4.37548,5.] and [9.,10.0544].

Exercise 8

Compute the limit: $\lim_{x\to\infty} 4 - x + 8x^2 - 8x^3$

1) $-\infty$

2) 0

3) 1

4) -4

5) -6

6) -8

7) ∞

Exercise 9

The population of certain country (in millions of habitants) is given by the function $P(t) = 25\left(\frac{-1+3t+t^2-8t^3}{9-3t-3t^2-8t^3}\right)^{-2-8t+8t^2}$. Determine the future tendency for this population.

1) $-\infty$

2) $\frac{25}{e^5}$

3) 0

4) $\frac{25}{e^3}$

5) $\frac{25}{e^4}$

6) 25

7) ∞

Exercise 10

The population in certain turistic area increases exponentially and is given by the function $P(t)=75000\, e^{t/50}$ that indicates the number of resident citizens for every year t. At the same time, depending on the season, the city receives a variable number of tourists given by the trigonometric function $I(t)=4000+1000\,\mathrm{Sin}\left[\frac{t}{2\pi}\right]$ that yields the amount of visitors in the area for every moment t (t in years). Determine how many years are necessary until the total nomber of habitants is 122000. (the solution can be found for t between 18 and 23).

1) t=**.0****

2) t=**.2****

3) t=**.4****

4) t=**.6****

5) t=**.8****

Exercise 11

Study the continuity of the function $f(x)=\begin{cases} -e^{x}-2\sin(x) & x\le 0 \\ -2 & 0<x<2 \\ -2\,e^{x-2}-2\sin(2-x) & 2\le x \end{cases}$

1) The functions is continuous for all points.

2) The functions is not continuous at any point.

3) The function is continuous for all the points except for x=0.

4) The function is continuous for all the points except for x=2.

5) The function is continuous for all the points except for x=0 and x=2.

Mathematics 1 - ADE/FyCo - 2020/2021
List of exercises 01-Functions for identity number: 77647383

Exercise 1

We have two bank accounts, the first in the bank A and the second in the bank B. In the bank A we obtain a periodic compound interes rate of 9% in 9 periods (compounding frequency) and in the bank B we are paid a continuous compound rate of 3% . We initially deposit 8000 euros in the bank A and 13 000 in B. How long time is it necessary until the money in both accounts is exactly the same?

Remark: To obtain a correct answer it is necessary to work with at least 5 decimal digits.

1) In **2.***** years.

2) In **8.***** years.

3) In **6.***** years.

4) In **0.***** years.

5) In **5.***** years.

Exercise 2

Certain parcel of land is revalued from an initial value of 119 000 euros until a final value of 328 000 euros along 10 years. Determine the rate of compound interes for that revaluation.

Remark: To obtain a correct answer it is necessary to work with at least 5 decimal digits.

1) The interest rate is **5.*****%.

2) The interest rate is **1.*****%.

3) The interest rate is **8.*****%.

4) The interest rate is **7.*****%.

5) The interest rate is **0.*****%.

Exercise 3

We have a bank account that initially offers a continuous compound rate of 5% , and after 4 years the conditions are modified and then we obtain a periodic compound interes rate of 5% in 6 periods (compounding frequency) . The initial deposit is 13 000 euros. Compute the amount of money in the account after 5 years from the moment of the first deposit.

1) We will have ****7.***** euros.

2) We will have ****5.***** euros.

3) We will have ****6.***** euros.

4) We will have ****8.***** euros.

5) We will have ****2.***** euros.

Exercise 4

A firm sells Q tons of certain product. The price received per ton is given by the formula P=8000-18Q. On the other hand, the production cost per ton is C=5000-9Q. In addition, the transportation cost is 2514 per ton. Compute the maximum profit that can be obtained selling this product.

1) Profit=7580.

2) Profit=7926.

3) Profit=3360.

4) Profit=5549.

5) Profit=6561.

Exercise 5

Deposits in certain investment account vary from year to year alternating gains and looses periods. We have the following data about the deposits for different years:

year	deposits
1	12
3	20
5	12

By means of a interpolation polynomial, obtain the function that yields the deposits in the account for every year t. Employ that function to determine the maximum funds available in the investment account.

1) The maximum for the depositis in the account was 3.

2) The maximum for the depositis in the account was 4.

3) The maximum for the depositis in the account was -1.

4) The maximum for the depositis in the account was 20.

5) The maximum for the depositis in the account was -12.

Exercise 6

The funds of a public institution alternate periods of deficit and surplus. We have the following information for several years (in millions of euros):

year	funds
2	27
4	23
7	2

Employ an interpolation polynomial to build a function that yields the funds for each year t. We know that due to the legislation the funds of such an institution have to be kept between 23 and 26. Compute (by means of the polynomial obtained before by interpolation) the periods along which the funds are between the indicated limits inside the interval of time where we have information (that is to say, from t=2 to t=7).

1) The funds are inside the limits for the inverval: [0,1].

2) The funds are inside the limits for the inverval: [4,7].

3) The funds are inside the limits for the inverval: [1,4].

4) The funds are inside the limits for the intervals: [0,0] y [3,4].

5) The funds are inside the limits for the inverval: [0,4].

6) The funds are inside the limits for the intervals: [0,1] y [3,7].

7) The funds are inside the limits for the inverval: [3,4].

8) The funds are inside the limits for the inverval: [1,7].

Exercise 7

The population of a city is studied between years t=4 and t=7. In that period the population is given by the function $P(t)=9+360\,t-66\,t^2+4\,t^3$. Determine the intervals of years when the population is between 667 and 713.

1) Along the interval of years: [7,7].

2) Along the interval of years: [5.691,6.].

3) Along the interval of years: [6.,7.65616].

4) Along the interval of years: [4,7].

5) Along the intervals of years: [4.07772,5.30735] and [6.,7.].

6) Along the interval of years: [4.40671,7.62812].

7) That number of mice is reach for no interval of years.

8) Along the interval of years: [4.75167,7.05598].

Exercise 8

Compute the limit: $\lim_{x\to-\infty} \frac{7 - x - 2x^2 - 4x^3}{-7 + 8x - 5x^2}$

1) $-\frac{1}{6}$

2) 0

3) $-\frac{3}{8}$

4) $-\infty$

5) ∞

6) $-\frac{1}{4}$

7) 1

Exercise 9

A factory produces certain type of devices. The marginal cost (cost of producing one unit) decreases when we produce a large amount of units and it is given by the function $C(x) = \frac{3 + 5x + 9x^2 + 9x^3}{4 + 7x + x^2 + 7x^3}$. Determine the expected cost per unit when a large amount of units is produced.

1) $\frac{33}{25}$

2) $\frac{9}{7}$

3) $-\frac{3}{5}$

4) ∞

5) 20 000

6) 0

7) $-\infty$

Exercise 10

The population in certain turistic area increases exponentially and is given by the function $P(t)=52\,000\, e^{t/100}$ that indicates the number of resident citizens for every year t. At the same time, depending on the season, the city receives a variable number of tourists given by the trigonometric function $I(t)=5000+3000\,\mathrm{Sin}\left[\frac{t}{2\pi}\right]$ that yields the amount of visitors in the area for every moment t (t in years). Determine how many years are necessary until the total nomber of habitants is 105000. (the solution can be found for t between 64 and 69).

1) t=**.1****

2) t=**.3****

3) t=**.5****

4) t=**.7****

5) t=**.9****

Exercise 11

Study the continuity of the function $f(x)=\begin{cases} e^{x+3}-\sin(x+3) & x\le -3 \\ -e^{x+3}-2\sin(x+3)+2 & -3<x<0 \\ -1 & 0\le x \end{cases}$

1) The functions is continuous for all points.

2) The functions is not continuous at any point.

3) The function is continuous for all the points except for x=-3.

4) The function is continuous for all the points except for x=0.

5) The function is continuous for all the points except for x=-3 and x=0.

Mathematics 1 - ADE/FyCo - 2020/2021
List of exercises 01-Functions for identity number: 77648906

Exercise 1

We have two bank accounts, the first in the bank A and the second in the bank B. In the bank A we obtain a periodic compound interes rate of 1% in 11 periods (compounding frequency) and in the bank B we are paid a periodic compound interes rate of 4% in 6 periods (compounding frequency). We initially deposit 11 000 euros in the bank A and 1000 in B. How long time is it necessary until the money in both accounts is exactly the same?

Remark: To obtain a correct answer it is necessary to work with at least 5 decimal digits.

1) In **8.***** years.

2) In **3.***** years.

3) In **7.***** years.

4) In **0.***** years.

5) In **6.***** years.

Exercise 2

We have one bank account that offers a compound interes rate of 5% where we initially deposit 8000 euros. How long time is it necessary until the amount of money in the account reaches 10 000 euros?

Remark: To obtain a correct answer it is necessary to work with at least 5 decimal digits.

1) In **0.***** years.

2) In **1.***** years.

3) In **7.***** years.

4) In **6.***** years.

5) In **4.***** years.

Exercise 3

We have a bank account that initially offers a compound interes rate of 2%, and after 1 year the conditions are modified and then we obtain a continuous compound rate of 7%. The initial deposit is 11 000 euros. Compute the amount of money in the account after 3 years from the moment of the first deposit.

1) We will have ****1.***** euros.

2) We will have ****3.***** euros.

3) We will have ****7.***** euros.

4) We will have ****4.***** euros.

5) We will have ****6.***** euros.

Exercise 4

A firm sells Q tons of certain product. The price received per ton is given by the formula P=1400−14Q. On the other hand, the production cost per ton is C=1100+6Q. In addition, the transportation cost is 260 per ton. Compute the maximum profit that can be obtained selling this product.

1) Profit=10.

2) Profit=29.

3) Profit=32.

4) Profit=26.

5) Profit=20.

Exercise 5

Deposits in certain investment account vary from year to year alternating gains and looses periods. We have the following data about the deposits for different years:

year	deposits
2	−3
3	−15
4	−33

By means of a interpolation polynomial, obtain the function that yields the deposits in the account for every year t. Employ that function to forecast the exact amount for year 5.

1) The depositis in the account for year 5 are −3.

2) The depositis in the account for year 5 are −57.

3) The depositis in the account for year 5 are −87.

4) The depositis in the account for year 5 are 8.

5) The depositis in the account for year 5 are 7.

Exercise 6

The funds of a public institution alternate periods of deficit and surplus. We have the following information for several years (in millions of euros):

year	funds
1	7
5	-9
7	-5

Employ an interpolation polynomial to build a function that yields the funds for each year t. We know that due to the legislation the funds of such an institution have to be kept between 0 and 7 . Compute (by means of the polynomial obtained before by interpolation) the periods along which the funds are between the indicated limits inside the interval of time where we have information (that is to say, from t=1 to t=7).

1) The funds are inside the limits for the inverval: [1,7].

2) The funds are inside the limits for the intervals: [1,2] y [7,9].

3) The funds are inside the limits for the inverval: [0,1].

4) The funds are inside the limits for the inverval: [0,8].

5) The funds are inside the limits for the inverval: [1,2].

6) The funds are inside the limits for the inverval: [7,8].

7) The funds are inside the limits for the inverval: [1,8].

8) The funds are inside the limits for the intervals: [0,2] y [8,9].

Exercise 7

Se realiza un estudio para analizar la población de cierto tipo de roedores en una comarca entre los años t=3 y t=7. En ese período la población viene dada por la función $P(t) = 3 + 240\,t - 54\,t^2 + 4\,t^3$ (en miles de roedores). Determinar durante qué años el número de miles de roedores se sitúa entre 299 y 345.

1) Along the intervals of years: [3.55314,4.] and [5.19341,6.].

2) Along the interval of years: [3,7].

3) Along the interval of years: [3.,5.2679].

4) That number of mice is reach for no interval of years.

5) Along the interval of years: [6.33151,7.].

6) Along the interval of years: [3,3].

7) Along the interval of years: [6.16142,7.68441].

8) Along the intervals of years: [3.,4.10804] and [5.,6.].

Exercise 8

Compute the limit: $\lim_{x\to\infty}\frac{9-7x-2x^2}{-6-4x+9x^2}$

1) ∞

2) -3

3) 0

4) $-\frac{2}{9}$

5) $-\infty$

6) 1

7) $-\frac{1}{6}$

Exercise 9

The population of certain country (in millions of habitants) is given by the function $P(t) = 8\left(\frac{7+7t-5t^2-t^3}{6+3t-8t^2-t^3}\right)^{7+3t}$. Determine the future tendency for this population.

1) $-\infty$

2) 8

3) $\frac{8}{e^2}$

4) $\frac{8}{e^5}$

5) ∞

6) 0

7) $\frac{8}{e^9}$

Exercise 10

We deposit 15000 euros in a bank account with a continuous compound rate of 1%. At the same time every year we also add in a safe-deposit box (therefore with no interest rate) 2000 euros. How long time is it necessary until the total ammount of money (jointly in the bank account and safe-depsit box) is 55000 euros? (the solution can be found for t between 16 and 21).

1) t=**.0****

2) t=**.2****

3) t=**.4****

4) t=**.6****

5) t=**.8****

Exercise 11

Study the continuity of the function $f(x) = \begin{cases} 3\sin(3-x) - 2\cos(3-x) & x \le 3 \\ 2\,e^{x-3} + \sin(3-x) - 4 & 3 < x < 4 \\ -2\sin(4-x) & 4 \le x \end{cases}$

1) The functions is continuous for all points.

2) The functions is not continuous at any point.

3) The function is continuous for all the points except for x=3.

4) The function is continuous for all the points except for x=4.

5) The function is continuous for all the points except for x=3 and x=4.

Mathematics 1 - ADE/FyCo - 2020/2021
List of exercises 01-Functions for identity number: 77770524

Exercise 1

We have two bank accounts, the first in the bank A and the second in the bank B. In the bank A we obtain a compound interes rate of 5% and in the bank B we are paid a compound interes rate of 2%. We initially deposit 2000 euros in the bank A and 6000 in B. How long time is it necessary until the money in both accounts is exactly the same?

Remark: To obtain a correct answer it is necessary to work with at least 5 decimal digits.

1) In **9.***** years.

2) In **1.***** years.

3) In **7.***** years.

4) In **0.***** years.

5) In **8.***** years.

Exercise 2

We have one bank account that offers a compound interes rate of 4% where we initially deposit 7000 euros. How long time is it necessary until the amount of money in the account reaches 16 000 euros?

Remark: To obtain a correct answer it is necessary to work with at least 5 decimal digits.

1) In **9.***** years.

2) In **7.***** years.

3) In **1.***** years.

4) In **0.***** years.

5) In **8.***** years.

Exercise 3

We have a bank account that initially offers a continuous compound rate of 4%, and after 1 year the conditions are modified and then we obtain a continuous compound rate of 6%. The initial deposit is 6000 euros. Compute the amount of money in the account after 5 years from the moment of the first deposit.

1) We will have ****1.***** euros.

2) We will have ****3.***** euros.

3) We will have ****8.***** euros.

4) We will have ****9.***** euros.

5) We will have ****0.***** euros.

Exercise 4

A firm sells Q tons of certain product. The price received per ton is given by the formula P=2000-4Q. On the other hand, the production cost per ton is C=1000+5Q. In addition, the transportation cost is 352 per ton. Compute the maximum profit that can be obtained selling this product.

1) Profit=11 664.

2) Profit=14 780.

3) Profit=5054.

4) Profit=18 686.

5) Profit=18 853.

Exercise 5

Deposits in certain investment account vary from year to year alternating gains and looses periods. We have the following data about the deposits for different years:

year	deposits
0	3
1	-1
3	-21

By means of a interpolation polynomial, obtain the function that yields the deposits in the account for every year t. Employ that function to forecast the exact amount for year 5.

1) The depositis in the account for year 5 are -81.

2) The depositis in the account for year 5 are 10.

3) The depositis in the account for year 5 are -57.

4) The depositis in the account for year 5 are 3.

5) The depositis in the account for year 5 are -12.

Exercise 6

The funds of a public institution alternate periods of deficit and surplus.
We have the following information for several years (in millions of euros):

year	funds
0	14
3	5
5	9

Employ an interpolation polynomial to build a function that yields the funds for each year t. We know that due to the legislation the funds of such an institution have to be kept between 6 and 9. Compute (by means of the polynomial obtained before by interpolation) the periods along which the funds are between the indicated limits inside the interval of time where we have information (that is to say, from t=0 to t=5).

1) The funds are inside the limits for the inverval: [1,5].

2) The funds are inside the limits for the inverval: [0,1].

3) The funds are inside the limits for the inverval: [4,5].

4) The funds are inside the limits for the intervals: [0,2] y [4,5].

5) The funds are inside the limits for the inverval: [1,2].

6) The funds are inside the limits for the intervals: [1,2] y [4,5].

7) The funds are inside the limits for the inverval: [0,4].

8) The funds are inside the limits for the inverval: [1,4].

Exercise 7

Se realiza un estudio para analizar la población de cierto tipo de roedores en una comarca entre los años t=0 y t=9. En ese período la población viene dada por la función $P(t) = 7 + 24t - 18t^2 + 4t^3$ (en miles de roedores). Determinar durante qué años el número de miles de roedores se sitúa entre 25 y 2447.

1) Along the interval of years: [4.,5.1995].

2) Along the interval of years: [5.,7.].

3) Along the interval of years: [0.732972,2.45597].

4) Along the interval of years: [3,9].

5) Along the intervals of years: [0,3] and [9,9].

6) Along the intervals of years: [1.51021,2.41812] and [3.,9.42693].

7) Along the intervals of years: [-4.45015×10^{-308},3.44424] and [4.,7.46916].

8) Along the interval of years: [8.,9.].

Exercise 8

Compute the limit: $\lim_{x\to-\infty} 1 - 4x - 4x^2 - 2x^3 + x^4$

1) -3

2) $-\infty$

3) ∞

4) -7

5) -5

6) 1

7) 0

Exercise 9

A factory produces certain type of devices. The marginal cost (cost of producing one unit) decreases when we produce a large amount of units and it is given by the function $C(x) = \dfrac{5 + x + 9x^2 + 5x^3 + 5x^4}{3 + 2x + 6x^2 + 7x^3 + 2x^4}$. Determine the expected cost per unit when a large amount of units is produced.

1) 0

2) $\dfrac{5}{2}$

3) ∞

4) 3000

5) -3

6) $\dfrac{253}{100}$

7) $-\infty$

Exercise 10

We deposit 5000 euros in a bank account with a continuous compound rate of 9%. At the same time every year we also add in a safe-deposit box (therefore with no interest rate) 1000 euros. How long time is it necessary until the total ammount of money (jointly in the bank account and safe-depsit box) is 55000 euros? (the solution can be found for t between 20 and 25).

1) t=**.0****

2) t=**.2****

3) t=**.4****

4) t=**.6****

5) t=**.8****

Exercise 11

Study the continuity of the function $f(x) = \begin{cases} \sin(x+2) - \cos(x+2) & x \leq -2 \\ \frac{2x}{3} + \frac{1}{3} & -2 < x < 1 \\ e^{x-1} + 3\sin(1-x) & 1 \leq x \end{cases}$

1) The functions is continuous for all points.

2) The functions is not continuous at any point.

3) The function is continuous for all the points except for $x=-2$.

4) The function is continuous for all the points except for $x=1$.

5) The function is continuous for all the points except for $x=-2$ and $x=1$.

Mathematics 1 - ADE/FyCo - 2020/2021
List of exercises 01-Functions for identity number: 78026316

Exercise 1

We have two bank accounts, the first in the bank A and the second in the bank B. In the bank A we obtain a periodic compound interes rate of 9% in 12 periods (compounding frequency) and in the bank B we are paid a continuous compound rate of 6%. We initially deposit 2000 euros in the bank A and 8000 in B. How long time is it necessary until the money in both accounts is exactly the same?

Remark: To obtain a correct answer it is necessary to work with at least 5 decimal digits.

1) In **0.***** years.

2) In **8.***** years.

3) In **5.***** years.

4) In **7.***** years.

5) In **6.***** years.

Exercise 2

We have one bank account that offers a compound interes rate of 3% where we initially deposit 12 000 euros. How long time is it necessary until the amount of money in the account reaches 19 000 euros?

Remark: To obtain a correct answer it is necessary to work with at least 5 decimal digits.

1) In **9.***** years.

2) In **7.***** years.

3) In **5.***** years.

4) In **0.***** years.

5) In **3.***** years.

Exercise 3

We have a bank account that initially offers a periodic compound interes rate of 7% in 7 periods (compounding frequency), and after 4 years the conditions are modified and then we obtain a compound interes rate of 4%. The initial deposit is 8000 euros. Compute the amount of money in the account after 4 years from the moment of the first deposit.

1) We will have ****9.***** euros.

2) We will have ****7.***** euros.

3) We will have ****0.***** euros.

4) We will have ****5.***** euros.

5) We will have ****3.***** euros.

Exercise 4

A firm sells Q tons of certain product. The price received per ton is given by the formula P=70000-9Q. On the other hand, the production cost per ton is C=40000+10Q. In addition, the transportation cost is 28518 per ton. Compute the maximum profit that can be obtained selling this product.

1) Profit=17 178.

2) Profit=22 493.

3) Profit=28 899.

4) Profit=26 951.

5) Profit=25 562.

Exercise 5

Deposits in certain investment account vary from year to year alternating gains and looses periods. We have the following data about the deposits for different years:

year	deposits
1	3
2	9
3	19

By means of a interpolation polynomial, obtain the function that yields the deposits in the account for every year t. Employ that function to forecast the exact amount for year 5.

1) The depositis in the account for year 5 are 73.

2) The depositis in the account for year 5 are -5.

3) The depositis in the account for year 5 are 19.

4) The depositis in the account for year 5 are 3.

5) The depositis in the account for year 5 are 51.

Exercise 6

The funds of a public institution alternate periods of deficit and surplus. We have the following information for several years (in millions of euros):

year	funds
0	25
4	73
8	57

Employ an interpolation polynomial to build a function that yields the funds for each year t. We know that due to the legislation the funds of such an institution have to be kept between 43 and 75 . Compute (by means of the polynomial obtained before by interpolation) the periods along which the funds are between the indicated limits inside the interval of time where we have information (that is to say, from t=0 to t=8).

1) The funds are inside the limits for the inverval: [-2,8].

2) The funds are inside the limits for the inverval: [0,9].

3) The funds are inside the limits for the inverval: [8,9].

4) The funds are inside the limits for the inverval: [8,8].

5) The funds are inside the limits for the inverval: [-2,4].

6) The funds are inside the limits for the inverval: [1,8].

7) The funds are inside the limits for the inverval: [-2,6].

8) The funds are inside the limits for the inverval: [0,8].

Exercise 7

The population of a city is studied between years t=1 and t=10. In that period the population is given by the function $P(t)=5+756t-96t^2+4t^3$. Determine the intervals of years when the population is between 1517 and 1949.

1) Along the intervals of years: [1.,3.08403] and [5.49821,8.62583].

2) Along the intervals of years: [2.,6.] and [8.27757,10.].

3) Along the interval of years: [2.62693,9.].

4) Along the interval of years: [3,6].

5) Along the intervals of years: [1.23454,2.77499] and [4.,8.].

6) Along the intervals of years: [3,6] and [9,9].

7) Along the interval of years: [8.,10.7754].

8) Along the intervals of years: [1,3] and [6,10].

Exercise 8

Compute the limit: $\lim_{x\to\infty}\left(\frac{8+2x+7x^2+5x^3}{1-x+8x^2+5x^3}\right)^{-4+2x}$

1) ∞

2) $-\infty$

3) $\frac{1}{e^{2/5}}$

4) $\frac{1}{e^5}$

5) 0

6) 1

7) $\frac{1}{e^4}$

Exercise 9

From an initial deposit 12000, the interest rate varies every year in such a way that the total amount of money in the account is given by the function $C(t) = 12\,000\left(\frac{-2-6t+2t^2}{-7+8t+2t^2}\right)^{-9+6t}$. Determine the future tendency for the deposits that we will have after a large number of years.

1) 12 000

2) 0

3) $\frac{12\,000}{e^{42}}$

4) $-\infty$

5) ∞

6) $\frac{12\,000}{e^{21\,001/500}}$

7) $\frac{12\,000}{e^5}$

Exercise 10

We deposit 15000 euros in a bank account with a continuous compound rate of 10%. At the same time every year we also add in a safe-deposit box (therefore with no interest rate) 5000 euros. How long time is it necessary until the total ammount of money (jointly in the bank account and safe-deposit box) is 61000 euros? (the solution can be found for t between 5 and 10).

1) t=**.0****

2) t=**.2****

3) t=**.4****

4) t=**.6****

5) t=**.8****

Exercise 11

Study the continuity of the function $f(x) = \begin{cases} \sin(x) & x \leq 0 \\ -\frac{x}{3} & 0 < x < 3 \\ 3\sin(3-x) - \cos(3-x) & 3 \leq x \end{cases}$

1) The functions is continuous for all points.

2) The functions is not continuous at any point.

3) The function is continuous for all the points except for x=0.

4) The function is continuous for all the points except for x=3.

5) The function is continuous for all the points except for x=0 and x=3.

Mathematics 1 - ADE/FyCo - 2020/2021
List of exercises 01-Functions for identity number: 78428692

Exercise 1

We have two bank accounts, the first in the bank A and the second in the bank B. In the bank A we obtain a periodic compound interes rate of 10% in 2 periods (compounding frequency) and in the bank B we are paid a continuous compound rate of 5%. We initially deposit 4000 euros in the bank A and 9000 in B. How long time is it necessary until the money in both accounts is exactly the same?

Remark: To obtain a correct answer it is necessary to work with at least 5 decimal digits.

1) In **9.***** years.

2) In **4.***** years.

3) In **7.***** years.

4) In **1.***** years.

5) In **0.***** years.

Exercise 2

We have one bank account that offers a periodic compound interes rate of 1% in 5 periods (compounding frequency) where we initially deposit 14 000 euros. How long time is it necessary until the amount of money in the account reaches 23 000 euros?

Remark: To obtain a correct answer it is necessary to work with at least 5 decimal digits.

1) In **9.***** years.

2) In **4.***** years.

3) In **7.***** years.

4) In **5.***** years.

5) In **0.***** years.

Exercise 3

We have a bank account that initially offers a continuous compound rate of 9%, and after 3 years the conditions are modified and then we obtain a compound interes rate of 2%. The initial deposit is 9000 euros. Compute the amount of money in the account after 9 years from the moment of the first deposit.

1) We will have ****1.***** euros.

2) We will have ****7.***** euros.

3) We will have ****9.***** euros.

4) We will have ****4.***** euros.

5) We will have ****0.***** euros.

Exercise 4

A firm sells Q tons of certain product. The price received per ton is given by the formula P=140000-11Q. On the other hand, the production cost per ton is C=110000+17Q. In addition, the transportation cost is 27648 per ton. Compute the maximum profit that can be obtained selling this product.

1) Profit=49 392.

2) Profit=31 599.

3) Profit=24 409.

4) Profit=19 024.

5) Profit=15 698.

Exercise 5

Deposits in certain investment account vary from year to year alternating gains and looses periods. We have the following data about the deposits for different years:

year	deposits
1	3
2	7
3	13

By means of a interpolation polynomial, obtain the function that yields the deposits in the account for every year t. Employ that function to forecast the exact amount for year 5.

1) The depositis in the account for year 5 are 1.

2) The depositis in the account for year 5 are -8.

3) The depositis in the account for year 5 are 31.

4) The depositis in the account for year 5 are 9.

5) The depositis in the account for year 5 are 43.

Exercise 6

The funds of a public institution alternate periods of deficit and surplus. We have the following information for several years (in millions of euros):

year	funds
1	30
3	42
7	42

Employ an interpolation polynomial to build a function that yields the funds for each year t. We know that due to the legislation the funds of such an institution have to be kept between 30 and 37. Compute (by means of the polynomial obtained before by interpolation) the periods along which the funds are between the indicated limits inside the interval of time where we have information (that is to say, from t=1 to t=7).

1) The funds are inside the limits for the inverval: [7,9].

2) The funds are inside the limits for the inverval: [0,9].

3) The funds are inside the limits for the intervals: [1,2] y [7,8].

4) The funds are inside the limits for the intervals: [0,1] y [8,9].

5) The funds are inside the limits for the inverval: [2,7].

6) The funds are inside the limits for the inverval: [1,2].

7) The funds are inside the limits for the inverval: [0,2].

8) The funds are inside the limits for the inverval: [2,9].

Exercise 7

The population of a city is studied between years t=2 and t=8. In that period the population is given by the function $P(t)=1+144t-42t^2+4t^3$. Determine the intervals of years when the population is between 217 and 811.

1) Along the intervals of years: [2.21872,3.5682] and [4.27615,5.].

2) Along the interval of years: [6,8].

3) Along the intervals of years: [3.13702,5.] and [6.,7.13972].

4) Along the intervals of years: [2,6] and [8,8].

5) Along the interval of years: [3.,5.].

6) Along the interval of years: [3.36894,6.].

7) Along the intervals of years: [3.,4.16521] and [6.01839,7.].

8) Along the interval of years: [6.37312,7.44742].

Exercise 8

Compute the limit: $\lim_{x\to-\infty}\left(\frac{-2-x+x^2-8x^3}{-3+4x+9x^2-8x^3}\right)^{-5-3x+5x^2}$

1) $\frac{1}{e^4}$

2) ∞

3) $\frac{1}{e^2}$

4) 0

5) $\frac{1}{e^5}$

6) 1

7) $-\infty$

Exercise 9

A factory produces certain type of devices. The marginal cost (cost of producing one unit) decreases when we produce a large amount of units and it is given by the function $C(x)=\frac{3+2x+7x^2+4x^3}{8+2x+8x^2+4x^3+5x^4}$. Determine the expected cost per unit when a large amount of units is produced.

1) $-\frac{1}{3}$

2) $-\frac{3}{8}$

3) ∞

4) 0

5) $-\infty$

6) $-\frac{3}{4}$

7) 9000

Exercise 10

General: $\frac{1}{5^{525.}}$ is too small to represent as a normalized machine number; precision may be lost.

General: Further output of General::munfl will be suppressed during this calculation.

We deposit 19000 euros in a bank account with a periodic compound interes rate of 4% in 8 periods (compounding frequency). At the same time every year we also add in a safe-deposit box (therefore with no interest rate) 2000 euros. How long time is it necessary until the total ammount of money (jointly in the bank account and safe-depsit box) is 66000 euros? (the solution can be found for t between 33 and 38
).

1) t=**.0****

2) t=**.2****

3) t=**.4****

4) t=**.6****

5) t=**.8****

Exercise 11

Study the continuity of the function $f(x) = \begin{cases} 2\cos(1-x) & x \le 1 \\ -2\,e^{x-1} + 2 + 2\,e^{3} & 1 < x < 4 \\ 2 & 4 \le x \end{cases}$

1) The functions is continuous for all points.

2) The functions is not continuous at any point.

3) The function is continuous for all the points except for x=1.

4) The function is continuous for all the points except for x=4.

5) The function is continuous for all the points except for x=1 and x=4.

Mathematics 1 - ADE/FyCo - 2020/2021
List of exercises 01-Functions for identity number: 753486173

Exercise 1

We have two bank accounts, the first in the bank A and the second in the bank B. In the bank A we obtain a compound interes rate of 6% and in the bank B we are paid a continuous compound rate of 1%. We initially deposit 4000 euros in the bank A and 13 000 in B. How long time is it necessary until the money in both accounts is exactly the same?

Remark: To obtain a correct answer it is necessary to work with at least 5 decimal digits.

1) In **0.***** years.

2) In **7.***** years.

3) In **4.***** years.

4) In **8.***** years.

5) In **6.***** years.

Exercise 2

Certain parcel of land is revalued from an initial value of 105 000 euros until a final value of 297 000 euros along 9 years. Determine the rate of periodic compound interes in 5 periods for that revaluation.

Remark: To obtain a correct answer it is necessary to work with at least 5 decimal digits.

1) The interest rate is **5.*****%.

2) The interest rate is **7.*****%.

3) The interest rate is **3.*****%.

4) The interest rate is **1.*****%.

5) The interest rate is **0.*****%.

Exercise 3

We have a bank account that initially offers a periodic compound interes rate of 2% in 11 periods (compounding frequency), and after 3 years the conditions are modified and then we obtain a continuous compound rate of 3% . The initial deposit is 13 000 euros. Compute the amount of money in the account after 4 years from the moment of the first deposit.

1) We will have ****0.***** euros.

2) We will have ****2.***** euros.

3) We will have ****3.***** euros.

4) We will have ****1.***** euros.

5) We will have ****7.***** euros.

Exercise 4

A firm sells Q tons of certain product. The price received per ton is given by the formula P=6000−18Q. On the other hand, the production cost per ton is C=3000+9Q. In addition, the transportation cost is 2244 per ton. Compute the maximum profit that can be obtained selling this product.

1) Profit=5292.

2) Profit=8185.

3) Profit=6081.

4) Profit=5889.

5) Profit=8833.

Exercise 5

Deposits in certain investment account vary from year to year alternating gains and looses periods. We have the following data about the deposits for different years:

year	deposits
0	6
2	6
4	−10

By means of a interpolation polynomial, obtain the function that yields the deposits in the account for every year t. Employ that function to determine the maximum funds available in the investment account.

1) The maximum for the depositis in the account was 8.

2) The maximum for the depositis in the account was 1.

3) The maximum for the depositis in the account was −42.

4) The maximum for the depositis in the account was −10.

5) The maximum for the depositis in the account was 19.

Exercise 6

The funds of a public institution alternate periods of deficit and surplus. We have the following information for several years (in millions of euros):

year	funds
2	-9
4	-21
6	-9

Employ an interpolation polynomial to build a function that yields the funds for each year t. We know that due to the legislation the funds of such an institution have to be kept between -18 and -9 . Compute (by means of the polynomial obtained before by interpolation) the periods along which the funds are between the indicated limits inside the interval of time where we have information (that is to say, from t=2 to t=6).

1) The funds are inside the limits for the inverval: [2,6].

2) The funds are inside the limits for the inverval: [2,5].

3) The funds are inside the limits for the inverval: [0,5].

4) The funds are inside the limits for the inverval: [2,3].

5) The funds are inside the limits for the inverval: [0,2].

6) The funds are inside the limits for the inverval: [5,6].

7) The funds are inside the limits for the intervals: [2,3] y [5,6].

8) The funds are inside the limits for the intervals: [0,3] y [5,6].

Exercise 7

The population of a city is studied between years t=4 and t=7. In that period the population is given by the function $P(t) = 2 + 360\,t - 66\,t^2 + 4\,t^3$. Determine the intervals of years when the population is between 652 and 706.

1) Along the intervals of years: [5,5] and [6.5,7].

2) Along the intervals of years: [4,6.5] and [7,7].

3) Along the intervals of years: [4.,5.] and [6.,7.69728].

4) Along the interval of years: [4.43446,7.].

5) Along the interval of years: [5.,7.].

6) Along the interval of years: [4.19037,7.].

7) Along the intervals of years: [4.32073,5.] and [6.,7.02815].

8) Along the interval of years: [6.5,7].

Exercise 8

Compute the limit: $\lim_{x\to-\infty} 4 - 8x - 2x^2 + 8x^3 - 8x^4$

1) $-\infty$

2) 5

3) -4

4) 1

5) -8

6) ∞

7) 0

Exercise 9

From an initial deposit 10000, the interest rate varies every year in such a way that the total amount of money in the account is given by the function $C(t) = 10\,000 \left(\frac{-8+4t+7t^2}{-1+t+7t^2}\right)^{-3+3t+8t^2}$. Determine the future tendency for the deposits that we will have after a large number of years.

1) 10 000

2) $\frac{10\,000}{e^4}$

3) $\frac{10\,000}{e^2}$

4) 0

5) $\frac{10\,000}{e^3}$

6) $-\infty$

7) ∞

Exercise 10

The population in certain turistic area increases exponentially and is given by the function $P(t) = 50\,000\, e^{t/50}$ that indicates the number of resident citizens for every year t. At the same time, depending on the season, the city receives a variable number of tourists given by the trigonometric function $I(t) = 3000 + 2000 \operatorname{Sin}\left[\frac{t}{2\pi}\right]$ that yields the amount of visitors in the area for every moment t (t in years). Determine how many years are necessary until the total nomber of habitants is 79000. (the solution can be found for t between 21 and 26).

1) t=**.0****

2) t=**.2****

3) t=**.4****

4) t=**.6****

5) t=**.8****

Exercise 11

Study the continuity of the function $f(x) = \begin{cases} 2\,e^{x+3} - 3\sin(x+3) & x \le -3 \\ -\frac{3x}{2} - \frac{7}{2} & -3 < x < -1 \\ -2\,e^{x+1} - 3\sin(x+1) & -1 \le x \end{cases}$

1) The functions is continuous for all points.

2) The functions is not continuous at any point.

3) The function is continuous for all the points except for x=-3.

4) The function is continuous for all the points except for x=-1.

5) The function is continuous for all the points except for x=-3 and x=-1.

Mathematics 1 - ADE/FyCo - 2020/2021
List of exercises 01-Functions for identity number: 10618500094

Exercise 1

We have two bank accounts, the first in the bank A and the second in the bank B. In the bank A we obtain a compound interes rate of 7% and in the bank B we are paid a continuous compound rate of 4%. We initially deposit 2000 euros in the bank A and 6000 in B. How long time is it necessary until the money in both accounts is exactly the same?

Remark: To obtain a correct answer it is necessary to work with at least 5 decimal digits.

1) In **9.***** years.

2) In **5.***** years.

3) In **3.***** years.

4) In **2.***** years.

5) In **0.***** years.

Exercise 2

We have one bank account that offers a continuous compound rate of 2% where we initially deposit 7000 euros. How long time is it necessary until the amount of money in the account reaches 9000 euros?

Remark: To obtain a correct answer it is necessary to work with at least 5 decimal digits.

1) In **2.***** years.

2) In **5.***** years.

3) In **3.***** years.

4) In **1.***** years.

5) In **0.***** years.

Exercise 3

We have a bank account that initially offers a compound interes rate of 8% , and after 3 years the conditions are modified and then we obtain a periodic compound interes rate of 5% in 10 periods (compounding frequency) . The initial deposit is 6000 euros. Compute the amount of money in the account after 4 years from the moment of the first deposit.

1) We will have ****2.***** euros.

2) We will have ****0.***** euros.

3) We will have ****7.***** euros.

4) We will have ****5.***** euros.

5) We will have ****4.***** euros.

Exercise 4

A firm sells Q tons of certain product. The price received per ton is given by the formula P=14000-4Q. On the other hand, the production cost per ton is C=1000+3Q. In addition, the transportation cost is 12860 per ton. Compute the maximum profit that can be obtained selling this product.

1) Profit=264.

2) Profit=794.

3) Profit=905.

4) Profit=1054.

5) Profit=700.

Exercise 5

Deposits in certain investment account vary from year to year alternating gains and looses periods. We have the following data about the deposits for different years:

year	deposits
1	0
2	-2
3	-4

By means of a interpolation polynomial, obtain the function that yields the deposits in the account for every year t. Employ that function to forecast the exact amount for year 4.

1) The depositis in the account for year 4 are -8.

2) The depositis in the account for year 4 are 0.

3) The depositis in the account for year 4 are -6.

4) The depositis in the account for year 4 are 17.

5) The depositis in the account for year 4 are 4.

Exercise 6

The funds of a public institution alternate periods of deficit and surplus.
We have the following information for several years (in millions of euros):

year	funds
0	17
3	11
6	41

Employ an interpolation polynomial to build a function that yields the funds for each year t. We know that due to the legislation the funds of such an institution have to be kept between 17 and 27. Compute (by means of the polynomial obtained before by interpolation) the periods along which the funds are between the indicated limits inside the interval of time where we have information (that is to say, from t=0 to t=6).

1) The funds are inside the limits for the inverval: [4,6].

2) The funds are inside the limits for the inverval: [0,4].

3) The funds are inside the limits for the intervals: [-1,0] y [5,6].

4) The funds are inside the limits for the inverval: [-1,4].

5) The funds are inside the limits for the inverval: [-2,6].

6) The funds are inside the limits for the inverval: [-1,6].

7) The funds are inside the limits for the intervals: [0,0] y [4,5].

8) The funds are inside the limits for the inverval: [-1,0].

Exercise 7

The population of a city is studied between years t=0 and t=9. In that period the population is given by the function $P(t)=4+288\,t-60\,t^2+4\,t^3$. Determine the intervals of years when the population is between 4 and 444.

1) Along the interval of years: [1.,7.].

2) Along the intervals of years: [1.36575,2.] and [3.04046,4.].

3) Along the interval of years: [6.,8.64496].

4) Along the intervals of years: [0,0], [3.26795,5] and [6.73205,9].

5) Along the intervals of years: [0,3.26795] and [5,6.73205].

6) Along the intervals of years: [1.64693,3.] and [6.,8.].

7) Along the interval of years: [3.21922,7.].

8) Along the interval of years: [4.,8.26187].

Exercise 8

Compute the limit: $\lim_{x\to\infty}\left(\frac{-6+3x+6x^2}{3-9x+6x^2}\right)^{7+4x}$

1) $-\infty$

2) $\frac{1}{e^3}$

3) ∞

4) 1

5) e^8

6) 0

7) $\frac{1}{e^4}$

Exercise 9

The population of certain country (in millions of habitants) is given by the function $P(t) = 22\left(\frac{7+7t-5t^2+7t^3}{-5-7t-7t^2+7t^3}\right)^{7+4t}$. Determine the future tendency for this population.

1) 22

2) $22\,e^{1141/1000}$

3) $\frac{22}{e^5}$

4) $-\infty$

5) 0

6) $22\,e^{8/7}$

7) ∞

Exercise 10

We deposit 6000 euros in a bank account with a continuous compound rate of 9%. At the same time every year we also add in a safe-deposit box (therefore with no interest rate) 5000 euros. How long time is it necessary until the total ammount of money (jointly in the bank account and safe-depsit box) is 50000 euros? (the solution can be found for t between 7 and 12).

1) t=**.0****

2) t=**.2****

3) t=**.4****

4) t=**.6****

5) t=**.8****

Exercise 11

Study the continuity of the function $f(x) = \begin{cases} \sin(x+2) + \cos(x+2) & x \le -2 \\ -2\cos(x+2) + 2 + 2\cos(1) & -2 < x < -1 \\ \log(x+2) + 2 & -1 \le x \end{cases}$

1) The functions is continuous for all points.

2) The functions is not continuous at any point.

3) The function is continuous for all the points except for $x=-2$.

4) The function is continuous for all the points except for $x=-1$.

5) The function is continuous for all the points except for $x=-2$ and $x=-1$.

Mathematics 1 - ADE/FyCo - 2020/2021
List of exercises 01-Functions for identity number: 10901600079

Exercise 1

We have two bank accounts, the first in the bank A and the second in the bank B. In the bank A we obtain a periodic compound interes rate of 6% in 5 periods (compounding frequency) and in the bank B we are paid a continuous compound rate of 9%. We initially deposit 5000 euros in the bank A and 1000 in B. How long time is it necessary until the money in both accounts is exactly the same?

Remark: To obtain a correct answer it is necessary to work with at least 5 decimal digits.

1) In **4.***** years.

2) In **3.***** years.

3) In **5.***** years.

4) In **0.***** years.

5) In **7.***** years.

Exercise 2

We have one bank account that offers a periodic compound interes rate of 6% in 5 periods (compounding frequency) where we initially deposit 6000 euros. How long time is it necessary until the amount of money in the account reaches 10 000 euros?

Remark: To obtain a correct answer it is necessary to work with at least 5 decimal digits.

1) In **7.***** years.

2) In **5.***** years.

3) In **3.***** years.

4) In **8.***** years.

5) In **0.***** years.

Exercise 3

We have a bank account that initially offers a continuous compound rate of 5%, and after 2 years the conditions are modified and then we obtain a continuous compound rate of 5%. The initial deposit is 5000 euros. Compute the amount of money in the account after 10 years from the moment of the first deposit.

1) We will have ****9.***** euros.

2) We will have ****3.***** euros.

3) We will have ****5.***** euros.

4) We will have ****0.***** euros.

5) We will have ****7.***** euros.

Exercise 4

A firm sells Q tons of certain product. The price received per ton is given by the formula P=1400-3Q. On the other hand, the production cost per ton is C=900-2Q. In addition, the transportation cost is 480 per ton. Compute the maximum profit that can be obtained selling this product.

1) Profit=168.

2) Profit=164.

3) Profit=56.

4) Profit=37.

5) Profit=100.

Exercise 5

Deposits in certain investment account vary from year to year alternating gains and looses periods. We have the following data about the deposits for different years:

year	deposits
2	8
3	20
5	62

By means of a interpolation polynomial, obtain the function that yields the deposits in the account for every year t. Employ that function to forecast the exact amount for year 6.

1) The depositis in the account for year 6 are 0.

2) The depositis in the account for year 6 are 92.

3) The depositis in the account for year 6 are 8.

4) The depositis in the account for year 6 are 128.

5) The depositis in the account for year 6 are 1.

Exercise 6

The funds of a public institution alternate periods of deficit and surplus.
We have the following information for several years (in millions of euros):

year	funds
0	12
2	4
5	22

Employ an interpolation polynomial to build a function that yields the funds for each year t. We know that due to the legislation the funds of such an institution have to be kept between 6 and 12
. Compute (by means of the polynomial obtained before by interpolation) the periods along which the funds are between the indicated limits inside the interval of time where we have information (that is to say, from t=0 to t=5).

1) The funds are inside the limits for the inverval: [0,1].

2) The funds are inside the limits for the intervals: [0,1] y [3,4].

3) The funds are inside the limits for the inverval: [0,0].

4) The funds are inside the limits for the inverval: [0,3].

5) The funds are inside the limits for the inverval: [-2,5].

6) The funds are inside the limits for the inverval: [3,5].

7) The funds are inside the limits for the inverval: [0,5].

8) The funds are inside the limits for the intervals: [0,1] y [4,5].

Exercise 7

The population of a city is studied between years t=0 and t=8. In that period the population is given by the function $P(t)=10+216\,t-54\,t^2+4\,t^3$
. Determine the intervals of years when the population is between 240 and 266.

1) Along the intervals of years: [0,1.68826], [2.18826,4], [5,6.81174] and [7.31174,8].

2) Along the interval of years: [-4.45015×10^{-308},2.03604].

3) Along the intervals of years: [2.,3.] and [6.,7.10662].

4) Along the interval of years: [2.,4.].

5) Along the intervals of years: [-4.45015×10^{-308},1.04237] and [6.,8.].

6) Along the interval of years: [-4.45015×10^{-308},7.05136].

7) Along the intervals of years: [1.68826,2.18826], [4,5] and [6.81174,7.31174].

8) Along the intervals of years: [4.38112,6.] and [7.,8.73297].

Exercise 8

Compute the limit: $\lim_{x\to\infty}\left(\frac{6+x+x^2+5x^3}{-1+9x-2x^2+5x^3}\right)^{8+4x+5x^2}$

1) $\frac{1}{e^5}$

2) 1

3) $\frac{1}{e^2}$

4) $\frac{1}{e^4}$

5) $-\infty$

6) 0

7) ∞

Exercise 9

The population of certain country (in millions of habitants) is given by the function $P(t) = 31\left(\frac{6+2t-2t^2+2t^3}{5-2t-4t^2+2t^3}\right)^{2-5t+4t^2}$. Determine the future tendency for this population.

1) 0

2) $\frac{31}{e^2}$

3) $31\,e$

4) $\frac{31}{e^3}$

5) 31

6) $-\infty$

7) ∞

Exercise 10

We deposit 4000 euros in a bank account with a compound interes rate of 6%. At the same time every year we also add in a safe-deposit box (therefore with no interest rate) 2000 euros. How long time is it necessary until the total ammount of money (jointly in the bank account and safe-depsit box) is 33000 euros? (the solution can be found for t between 8 and 13).

1) t=**.1****

2) t=**.3****

3) t=**.5****

4) t=**.7****

5) t=**.9****

Exercise 11

Study the continuity of the function $f(x) = \begin{cases} -2\sin(x+3) - \cos(x+3) & x \le -3 \\ \log(x+4) - 1 - \log(4) & -3 < x < 0 \\ -3\sin(x) - \cos(x) & 0 \le x \end{cases}$

1) The functions is continuous for all points.

2) The functions is not continuous at any point.

3) The function is continuous for all the points except for x=-3.

4) The function is continuous for all the points except for x=0.

5) The function is continuous for all the points except for x=-3 and x=0.

Mathematics 1 - ADE/FyCo - 2020/2021
List of exercises 01-Functions for identity number: 11116551121

Exercise 1

We have two bank accounts, the first in the bank A and the second in the bank B. In the bank A we obtain a continuous compound rate of 9% and in the bank B we are paid a periodic compound interes rate of 3% in 3 periods (compounding frequency). We initially deposit 1000 euros in the bank A and 9000 in B. How long time is it necessary until the money in both accounts is exactly the same?

Remark: To obtain a correct answer it is necessary to work with at least 5 decimal digits.

1) In **0.***** years.

2) In **6.***** years.

3) In **3.***** years.

4) In **7.***** years.

5) In **1.***** years.

Exercise 2

We have one bank account that offers a continuous compound rate of 5% where we initially deposit 14 000 euros. How long time is it necessary until the amount of money in the account reaches 21 000 euros?

Remark: To obtain a correct answer it is necessary to work with at least 5 decimal digits.

1) In **6.***** years.

2) In **8.***** years.

3) In **0.***** years.

4) In **3.***** years.

5) In **1.***** years.

Exercise 3

We have a bank account that initially offers a periodic compound interes rate of 1% in 3 periods (compounding frequency), and after 3 years the conditions are modified and then we obtain a compound interes rate of 5%. The initial deposit is 9000 euros. Compute the amount of money in the account after 8 years from the moment of the first deposit.

1) We will have ****8.***** euros.

2) We will have ****5.***** euros.

3) We will have ****1.***** euros.

4) We will have ****3.***** euros.

5) We will have ****0.***** euros.

Exercise 4

A firm sells Q tons of certain product. The price received per ton is given by the formula P=15000−11Q. On the other hand, the production cost per ton is C=2000+2Q. In addition, the transportation cost is 12896 per ton. Compute the maximum profit that can be obtained selling this product.

1) Profit=237.

2) Profit=292.

3) Profit=109.

4) Profit=208.

5) Profit=313.

Exercise 5

Deposits in certain investment account vary from year to year alternating gains and looses periods. We have the following data about the deposits for different years:

year	deposits
1	5
3	31
5	81

By means of a interpolation polynomial, obtain the function that yields the deposits in the account for every year t. Employ that function to forecast the exact amount for year 7.

1) The depositis in the account for year 7 are 201.

2) The depositis in the account for year 7 are 3.

3) The depositis in the account for year 7 are 155.

4) The depositis in the account for year 7 are 15.

5) The depositis in the account for year 7 are 4.

Exercise 6

The funds of a public institution alternate periods of deficit and surplus.
We have the following information for several years (in millions of euros):

year	funds
1	48
3	72
5	72

Employ an interpolation polynomial to build a function that yields the funds for each year t. We know that due to the legislation the funds of such an institution have to be kept between 48 and 72. Compute (by means of the polynomial obtained before by interpolation) the periods along which the funds are between the indicated limits inside the interval of time where we have information (that is to say, from t=1 to t=5).

1) The funds are inside the limits for the inverval: [1,3].

2) The funds are inside the limits for the inverval: [0,3].

3) The funds are inside the limits for the inverval: [5,7].

4) The funds are inside the limits for the intervals: [0,1] y [5,7].

5) The funds are inside the limits for the inverval: [3,5].

6) The funds are inside the limits for the inverval: [0,7].

7) The funds are inside the limits for the intervals: [1,3] y [5,5].

8) The funds are inside the limits for the inverval: [3,7].

Exercise 7

The population of a city is studied between years t=2 and t=8. In that period the population is given by the function $P(t)=9+504t-78t^2+4t^3$. Determine the intervals of years when the population is between 737 and 1087.

1) Along the intervals of years: [2.11725,5.24417] and [6.19989,8.69588].

2) Along the intervals of years: [2,5.5] and [7,7].

3) Along the interval of years: [5.78256,6.2415].

4) Along the interval of years: [3.,6.].

5) Along the interval of years: [3.,7.06983].

6) Along the intervals of years: [3.02208,4.] and [6.52215,8.].

7) Along the interval of years: [2,5.5].

8) Along the intervals of years: [2,2] and [5.5,8].

Exercise 8

Compute the limit: $\lim_{x\to-\infty}\left(\frac{9-7x+2x^2+9x^3}{3+8x+x^2+9x^3}\right)^{-4-x+3x^2}$

1) 1

2) ∞

3) $\frac{1}{e^5}$

4) $-\infty$

5) $\frac{1}{e^2}$

6) $\frac{1}{e}$

7) 0

Exercise 9

A factory produces certain type of devices. The marginal cost (cost of producing one unit) decreases when we produce a large amount of units and it is given by the function $C(x)=\frac{9+x+7x^2+x^3+2x^4}{7+6x+3x^2+9x^3+6x^4}$. Determine the expected cost per unit when a large amount of units is produced.

1) -2

2) $\frac{1}{3}$

3) $-\infty$

4) 13 000

5) 0

6) ∞

7) $\frac{17}{50}$

Exercise 10

We deposit 20000 euros in a bank account with a periodic compound interes rate of 3% in 3 periods (compounding frequency). At the same time every year we also add in a safe-deposit box (therefore with no interest rate) 1000 euros. How long time is it necessary until the total ammount of money (jointly in the bank account and safe-depsit box) is 56000 euros? (the solution can be found for t between 53 and 58).

1) t=**.0****

2) t=**.2****

3) t=**.4****

4) t=**.6****

5) t=**.8****

Exercise 11

Study the continuity of the function $f(x)=\begin{cases} 3\sin(1-x) & x\le 1 \\ \frac{2x}{3}-\frac{5}{3} & 1<x<4 \\ e^{x-4}-\sin(4-x) & 4\le x \end{cases}$

1) The functions is continuous for all points.

2) The functions is not continuous at any point.

3) The function is continuous for all the points except for x=1.

4) The function is continuous for all the points except for x=4.

5) The function is continuous for all the points except for x=1 and x=4.

Mathematics 1 - ADE/FyCo - 2020/2021
List of exercises 01-Functions for identity number: 20531650581

Exercise 1

We have two bank accounts, the first in the bank A and the second in the bank B. In the bank A we obtain a continuous compound rate of 10% and in the bank B we are paid a periodic compound interes rate of 2% in 10 periods (compounding frequency). We initially deposit 5000 euros in the bank A and 10 000 in B. How long time is it necessary until the money in both accounts is exactly the same?

Remark: To obtain a correct answer it is necessary to work with at least 5 decimal digits.

1) In **6.***** years.

2) In **3.***** years.

3) In **8.***** years.

4) In **5.***** years.

5) In **0.***** years.

Exercise 2

We have one bank account that offers a compound interes rate of 4% where we initially deposit 15 000 euros. How long time is it necessary until the amount of money in the account reaches 22 000 euros?

Remark: To obtain a correct answer it is necessary to work with at least 5 decimal digits.

1) In **0.***** years.

2) In **8.***** years.

3) In **3.***** years.

4) In **6.***** years.

5) In **9.***** years.

Exercise 3

We have a bank account that initially offers a continuous compound rate of 4%, and after 3 years the conditions are modified and then we obtain a periodic compound interes rate of 10% in 12 periods (compounding frequency). The initial deposit is 10 000 euros. Compute the amount of money in the account after 7 years from the moment of the first deposit.

1) We will have ****8.***** euros.

2) We will have ****5.***** euros.

3) We will have ****2.***** euros.

4) We will have ****9.***** euros.

5) We will have ****1.***** euros.

Exercise 4

A firm sells Q tons of certain product. The price received per ton is given by the formula P=150000−12Q. On the other hand, the production cost per ton is C=130000+6Q. In addition, the transportation cost is 18632 per ton. Compute the maximum profit that can be obtained selling this product.

1) Profit=41 258.

2) Profit=15 567.

3) Profit=25 992.

4) Profit=37 834.

5) Profit=21 781.

Exercise 5

Deposits in certain investment account vary from year to year alternating gains and looses periods. We have the following data about the deposits for different years:

year	deposits
1	3
2	−1
3	−9

By means of a interpolation polynomial, obtain the function that yields the deposits in the account for every year t. Employ that function to forecast the exact amount for year 5.

1) The depositis in the account for year 5 are 13.

2) The depositis in the account for year 5 are −12.

3) The depositis in the account for year 5 are −1.

4) The depositis in the account for year 5 are −37.

5) The depositis in the account for year 5 are −57.

Exercise 6

The funds of a public institution alternate periods of deficit and surplus. We have the following information for several years (in millions of euros):

year	funds
1	34
4	40
6	24

Employ an interpolation polynomial to build a function that yields the funds for each year t. We know that due to the legislation the funds of such an institution have to be kept between 34 and 40 . Compute (by means of the polynomial obtained before by interpolation) the periods along which the funds are between the indicated limits inside the interval of time where we have information (that is to say, from t=1 to t=6).

1) The funds are inside the limits for the inverval: [2,5].

2) The funds are inside the limits for the inverval: [0,2].

3) The funds are inside the limits for the intervals: [0,1] y [4,5].

4) The funds are inside the limits for the inverval: [1,2].

5) The funds are inside the limits for the intervals: [1,2] y [4,5].

6) The funds are inside the limits for the inverval: [5,6].

7) The funds are inside the limits for the inverval: [0,5].

8) The funds are inside the limits for the inverval: [2,6].

Exercise 7

The population of a city is studied between years t=2 and t=9. In that period the population is given by the function $P(t)=7+240t-54t^2+4t^3$. Determine the intervals of years when the population is between 197 and 303.

1) Along the interval of years: [7.,9.63262].

2) Along the interval of years: [5.04542,6.4013].

3) Along the interval of years: [3.,9.64045].

4) Along the interval of years: [2,9].

5) Along the intervals of years: [2.,3.34529] and [6.13015,7.31982].

6) Along the interval of years: [4.52932,8.68931].

7) Along the interval of years: [2,2].

8) That number of mice is reach for no interval of years.

Exercise 8

Compute the limit: $\lim_{x\to-\infty}\left(\frac{-4+6x+6x^2-9x^3}{-9+9x+2x^2-9x^3}\right)^{-7+2x}$

1) 0

2) $\frac{1}{e^3}$

3) $\frac{1}{e^{8/9}}$

4) $\frac{1}{e^4}$

5) ∞

6) 1

7) $-\infty$

Exercise 9

A factory produces certain type of devices. The marginal cost (cost of producing one unit) decreases when we produce a large amount of units and it is given by the function $C(x)=\frac{4+7x+2x^2+9x^3+9x^4}{4+x+x^2+6x^3+6x^4}$. Determine the expected cost per unit when a large amount of units is produced.

1) ∞

2) 20 000

3) 0

4) $\frac{39}{25}$

5) $\frac{3}{2}$

6) $-\infty$

7) -1

Exercise 10

We deposit 6000 euros in a bank account with a compound interes rate of 9%. At the same time every year we also add in a safe-deposit box (therefore with no interest rate) 3000 euros. How long time is it necessary until the total ammount of money (jointly in the bank account and safe-depsit box) is 49000 euros? (the solution can be found for t between 8 and 13).

1) t=**.1****

2) t=**.3****

3) t=**.5****

4) t=**.7****

5) t=**.9****

Exercise 11

Study the continuity of the function $f(x) = \begin{cases} -3\sin(2-x) - \cos(2-x) & x \le 2 \\ -2\sin(2-x) - 2\sin(2) & 2 < x < 4 \end{cases}$

1) The functions is continuous for all points.

2) The functions is not continuous at any point.

3) The function is continuous for all the points except for x=2.

4) The function is continuous for all the points except for x=4.

5) The function is continuous for all the points except for x=2 and x=4.

Mathematics 1 - ADE/FyCo - 2020/2021
List of exercises 01-Functions for identity number: 20705551589

Exercise 1

We have two bank accounts, the first in the bank A and the second in the bank B. In the bank A we obtain a compound interes rate of 6% and in the bank B we are paid a compound interes rate of 2%. We initially deposit 3000 euros in the bank A and 9000 in B. How long time is it necessary until the money in both accounts is exactly the same?

Remark: To obtain a correct answer it is necessary to work with at least 5 decimal digits.

1) In **8.***** years.

2) In **4.***** years.

3) In **2.***** years.

4) In **3.***** years.

5) In **1.***** years.

Exercise 2

We have one bank account that offers a continuous compound rate of 3% where we initially deposit 13 000 euros. How long time is it necessary until the amount of money in the account reaches 20 000 euros?

Remark: To obtain a correct answer it is necessary to work with at least 5 decimal digits.

1) In **3.***** years.

2) In **4.***** years.

3) In **1.***** years.

4) In **0.***** years.

5) In **8.***** years.

Exercise 3

We have a bank account that initially offers a continuous compound rate of 3%, and after 4 years the conditions are modified and then we obtain a compound interes rate of 4%. The initial deposit is 9000 euros. Compute the amount of money in the account after 3 years from the moment of the first deposit.

1) We will have ****3.***** euros.

2) We will have ****7.***** euros.

3) We will have ****1.***** euros.

4) We will have ****4.***** euros.

5) We will have ****8.***** euros.

Exercise 4

A firm sells Q tons of certain product. The price received per ton is given by the formula P=140000−10Q. On the other hand, the production cost per ton is C=30000+10Q. In addition, the transportation cost is 108000 per ton. Compute the maximum profit that can be obtained selling this product.

1) Profit=26 631.

2) Profit=50 000.

3) Profit=21 235.

4) Profit=47 451.

5) Profit=27 058.

Exercise 5

Deposits in certain investment account vary from year to year alternating gains and looses periods. We have the following data about the deposits for different years:

year	deposits
1	0
3	−14
4	−27

By means of a interpolation polynomial, obtain the function that yields the deposits in the account for every year t. Employ that function to forecast the exact amount for year 5.

1) The depositis in the account for year 5 are −44.

2) The depositis in the account for year 5 are −65.

3) The depositis in the account for year 5 are −8.

4) The depositis in the account for year 5 are −2.

5) The depositis in the account for year 5 are −16.

Exercise 6

The funds of a public institution alternate periods of deficit and surplus. We have the following information for several years (in millions of euros):

year	funds
1	9
3	21
5	57

Employ an interpolation polynomial to build a function that yields the funds for each year t. We know that due to the legislation the funds of such an institution have to be kept between 12 and 21. Compute (by means of the polynomial obtained before by interpolation) the periods along which the funds are between the indicated limits inside the interval of time where we have information (that is to say, from t=1 to t=5).

1) The funds are inside the limits for the inverval: [-1,0].

2) The funds are inside the limits for the inverval: [2,3].

3) The funds are inside the limits for the inverval: [2,5].

4) The funds are inside the limits for the inverval: [-1,2].

5) The funds are inside the limits for the inverval: [0,2].

6) The funds are inside the limits for the intervals: [0,0] y [2,3].

7) The funds are inside the limits for the intervals: [-1,0] y [3,5].

8) The funds are inside the limits for the inverval: [-1,5].

Exercise 7

The population of a city is studied between years t=2 and t=7. In that period the population is given by the function $P(t) = 5 + 144\,t - 42\,t^2 + 4\,t^3$. Determine the intervals of years when the population is between 167 and 175.

1) Along the interval of years: [2.51914,5.].

2) Along the interval of years: [4.5,5].

3) Along the intervals of years: [2,4.5] and [5,7].

4) Along the intervals of years: [2.34906,3.] and [4.,5.].

5) Along the intervals of years: [3,3] and [4.5,5].

6) Along the intervals of years: [4.,5.00392] and [6.39637,7.].

7) Along the intervals of years: [2.,3.] and [4.,6.72516].

8) Along the interval of years: [4.,6.].

Exercise 8

Compute the limit: $\lim_{x\to-\infty} 4 + 2x - 5x^2 - 5x^3$

1) $-\infty$

2) 0

3) -4

4) ∞

5) 1

6) -8

7) -5

Exercise 9

A factory produces certain type of devices. The marginal cost (cost of producing one unit) decreases when we produce a large amount of units and it is given by the function $C(x) = \frac{5 + 6x + 2x^2}{1 + 3x + 3x^2 + 3x^3 + 3x^4}$. Determine the expected cost per unit when a large amount of units is produced.

1) ∞

2) $-\infty$

3) $-\frac{3}{7}$

4) 0

5) $-\frac{1}{4}$

6) $-\frac{1}{2}$

7) 3000

Exercise 10

We deposit 17000 euros in a bank account with a periodic compound interes rate of 8% in 8 periods (compounding frequency). At the same time every year we also add in a safe-deposit box (therefore with no interest rate) 1000 euros. How long time is it necessary until the total ammount of money (jointly in the bank account and safe-depsit box) is 46000 euros? (the solution can be found for t between 45 and 50).

1) t=**.0****

2) t=**.2****

3) t=**.4****

4) t=**.6****

5) t=**.8****

Exercise 11

Study the continuity of the function $f(x) = \begin{cases} \sin(1-x) - \cos(1-x) & x \leq 1 \\ -\frac{x}{2} - \frac{1}{2} & 1 < x < 3 \\ -\sin(3-x) - 2\cos(3-x) & 3 \leq x \end{cases}$

1) The functions is continuous for all points.

2) The functions is not continuous at any point.

3) The function is continuous for all the points except for x=1.

4) The function is continuous for all the points except for x=3.

5) The function is continuous for all the points except for x=1 and x=3.

Mathematics 1 - ADE/FyCo - 2020/2021
List of exercises 01-Functions for identity number: 20714551324

Exercise 1

We have two bank accounts, the first in the bank A and the second in the bank B. In the bank A we obtain a periodic compound interes rate of 3% in 11 periods (compounding frequency) and in the bank B we are paid a periodic compound interes rate of 7% in 4 periods (compounding frequency). We initially deposit 15 000 euros in the bank A and 10 000 in B. How long time is it necessary until the money in both accounts is exactly the same?

Remark: To obtain a correct answer it is necessary to work with at least 5 decimal digits.

1) In **8.***** years.

2) In **7.***** years.

3) In **2.***** years.

4) In **3.***** years.

5) In **0.***** years.

Exercise 2

Certain parcel of land is devalued from an initial value of 397 000 euros until a final value of 190 000 euros along 6 years. Determine the rate of periodic compound interes with monthly periodic frequency for that devaluation.

Remark: To obtain a correct answer it is necessary to work with at least 5 decimal digits.

1) The interest rate is **4.*****%.

2) The interest rate is **2.*****%.

3) The interest rate is **7.*****%.

4) The interest rate is **6.*****%.

5) The interest rate is **3.*****%.

Exercise 3

We have a bank account that initially offers a compound interes rate of 6%, and after 3 years the conditions are modified and then we obtain a periodic compound interes rate of 4% in 12 periods (compounding frequency). The initial deposit is 15 000 euros. Compute the amount of money in the account after 9 years from the moment of the first deposit.

1) We will have ****3.***** euros.

2) We will have ****1.***** euros.

3) We will have ****2.***** euros.

4) We will have ****7.***** euros.

5) We will have ****5.***** euros.

Exercise 4

A firm sells Q tons of certain product. The price received per ton is given by the formula P=9000-20Q. On the other hand, the production cost per ton is C=6000-17Q. In addition, the transportation cost is 2868 per ton. Compute the maximum profit that can be obtained selling this product.

1) Profit=1967.

2) Profit=738.

3) Profit=1545.

4) Profit=2396.

5) Profit=1452.

Exercise 5

Deposits in certain investment account vary from year to year alternating gains and looses periods. We have the following data about the deposits for different years:

year	deposits
0	106
2	58
3	40

By means of a interpolation polynomial, obtain the function that yields the deposits in the account for every year t. Employ that function to determine the minimum funds available in the investment account.

1) The minimum for the depositis in the account was 10.

2) The minimum for the depositis in the account was 7.

3) The minimum for the depositis in the account was 11.

4) The minimum for the depositis in the account was -5.

5) The minimum for the depositis in the account was 8.

Exercise 6

The funds of a public institution alternate periods of deficit and surplus. We have the following information for several years (in millions of euros):

year	funds
2	10
5	37
9	101

Employ an interpolation polynomial to build a function that yields the funds for each year t. We know that due to the legislation the funds of such an institution have to be kept between 17 and 82. Compute (by means of the polynomial obtained before by interpolation) the periods along which the funds are between the indicated limits inside the interval of time where we have information (that is to say, from t=2 to t=9).

1) The funds are inside the limits for the inverval: [3,8].

2) The funds are inside the limits for the inverval: [0,3].

3) The funds are inside the limits for the inverval: [3,9].

4) The funds are inside the limits for the inverval: [-10,-5].

5) The funds are inside the limits for the inverval: [-10,3].

6) The funds are inside the limits for the inverval: [-10,9].

7) The funds are inside the limits for the intervals: [-10,-5] y [8,9].

8) The funds are inside the limits for the inverval: [-10,0].

Exercise 7

The population of a city is studied between years t=3 and t=8. In that period the population is given by the function $P(t)=10+420\,t-72\,t^2+4\,t^3$. Determine the intervals of years when the population is between 794 and 810.

1) Along the intervals of years: [3,4], [5,5], [7,7] and [8,8].

2) Along the interval of years: [4.51677,7.].

3) Along the intervals of years: [3.,4.40553] and [5.29116,8.42361].

4) Along the interval of years: [4,8].

5) Along the intervals of years: [5.05854,6.4293] and [7.,8.12718].

6) Along the interval of years: [3.2404,4.28096].

7) Along the interval of years: [4.73577,7.].

8) Along the intervals of years: [3.,5.33245] and [7.,8.].

Exercise 8

Compute the limit: $\lim_{x\to\infty} -9 - 7x + x^2 + x^3 - 6x^4$

1) -1

2) -5

3) ∞

4) 1

5) 0

6) $-\infty$

7) -4

Exercise 9

From an initial deposit 18000, the interest rate varies every year in such a way that the total amount of money in the account is given by the function $C(t) = 18\,000\left(\frac{-8+5t+t^2}{6+9t+t^2}\right)^{3+9t}$. Determine the future tendency for the deposits that we will have after a large number of years.

1) ∞

2) $\frac{18\,000}{e^{36}}$

3) $-\infty$

4) $\frac{18\,000}{e^{3}}$

5) $\frac{18\,000}{e^{5}}$

6) 0

7) $18\,000$

Exercise 10

... FindRoot: The line search decreased the step size to within tolerance specified by AccuracyGoal and PrecisionGoal but was unable to find a sufficient decrease in the merit function. You may need more than MachinePrecision digits of working precision to meet these tolerances.

The population in certain turistic area increases exponentially and is given by the function $P(t)=91\,000\, e^{t/100}$ that indicates the number of resident citizens for every year t. At the same time, depending on the season, the city receives a variable number of tourists given by the trigonometric function $I(t)=3000+2000\,\mathrm{Sin}\left[\frac{t}{2\pi}\right]$ that yields the amount of visitors in the area for every moment t (t in years). Determine how many years are necessary until the total nomber of habitants is 137000. (the solution can be found for t between 37 and 42).

1) t=**.0****

2) t=**.2****

3) t=**.4****

4) t=**.6****

5) t=**.8****

Exercise 11

Study the continuity of the function $f(x)=\begin{cases} 2\, e^{x-3}-3\sin(3-x) & x\le 3 \\ e^{x-3}+\sin(3-x)+1 & 3<x<6 \\ 1-\log(x-5) & 6\le x \end{cases}$

1) The functions is continuous for all points.

2) The functions is not continuous at any point.

3) The function is continuous for all the points except for x=3.

4) The function is continuous for all the points except for x=6.

5) The function is continuous for all the points except for x=3 and x=6.

Mathematics 1 - ADE/FyCo - 2020/2021
List of exercises 01-Functions for identity number: 20730551515

Exercise 1

We have two bank accounts, the first in the bank A and the second in the bank B. In the bank A we obtain a periodic compound interes rate of 6% in 3 periods (compounding frequency) and in the bank B we are paid a compound interes rate of 1%. We initially deposit 3000 euros in the bank A and 8000 in B. How long time is it necessary until the money in both accounts is exactly the same?

Remark: To obtain a correct answer it is necessary to work with at least 5 decimal digits.

1) In **7.***** years.

2) In **9.***** years.

3) In **0.***** years.

4) In **8.***** years.

5) In **1.***** years.

Exercise 2

Certain parcel of land is devalued from an initial value of 493 000 euros until a final value of 134 000 euros along 5 years. Determine the rate of periodic compound interes in 11 periods for that devaluation.

Remark: To obtain a correct answer it is necessary to work with at least 5 decimal digits.

1) The interest rate is **5.*****%.

2) The interest rate is **0.*****%.

3) The interest rate is **8.*****%.

4) The interest rate is **3.*****%.

5) The interest rate is **1.*****%.

Exercise 3

We have a bank account that initially offers a compound interes rate of 2%, and after 3 years the conditions are modified and then we obtain a continuous compound rate of 7%. The initial deposit is 8000 euros. Compute the amount of money in the account after 3 years from the moment of the first deposit.

1) We will have ****9.***** euros.

2) We will have ****3.***** euros.

3) We will have ****1.***** euros.

4) We will have ****0.***** euros.

5) We will have ****7.***** euros.

Exercise 4

A firm sells Q tons of certain product. The price received per ton is given by the formula $P = 90000 - 20Q$. On the other hand, the production cost per ton is $C = 30000 + 13Q$. In addition, the transportation cost is 58020 per ton. Compute the maximum profit that can be obtained selling this product.

1) Profit=29 700.

2) Profit=26 014.

3) Profit=29 367.

4) Profit=18 965.

5) Profit=19 216.

Exercise 5

Deposits in certain investment account vary from year to year alternating gains and looses periods. We have the following data about the deposits for different years:

year	deposits
2	76
3	54
4	36

By means of a interpolation polynomial, obtain the function that yields the deposits in the account for every year t. Employ that function to determine the minimum funds available in the investment account.

1) The minimum for the depositis in the account was -5.

2) The minimum for the depositis in the account was 6.

3) The minimum for the depositis in the account was 8.

4) The minimum for the depositis in the account was 4.

5) The minimum for the depositis in the account was -8.

Exercise 6

The funds of a public institution alternate periods of deficit and surplus. We have the following information for several years (in millions of euros):

year	funds
2	16
4	16
6	24

Employ an interpolation polynomial to build a function that yields the funds for each year t. We know that due to the legislation the funds of such an institution have to be kept between −15 and 19. Compute (by means of the polynomial obtained before by interpolation) the periods along which the funds are between the indicated limits inside the interval of time where we have information (that is to say, from t=2 to t=6).

1) The funds are inside the limits for the inverval: [0,5].

2) The funds are inside the limits for the inverval: [1,6].

3) The funds are inside the limits for the inverval: [5,6].

4) The funds are inside the limits for the inverval: [2,5].

5) The funds are inside the limits for the inverval: [−1,5].

6) The funds are inside the limits for the inverval: [0,6].

7) The funds are inside the limits for the inverval: [−1,3].

8) The funds are inside the limits for the inverval: [6,6].

Exercise 7

Se realiza un estudio para analizar la población de cierto tipo de roedores en una comarca entre los años t=3 y t=10. En ese período la población viene dada por la función $P(t) = 3 + 384\,t - 72\,t^2 + 4\,t^3$ (en miles de roedores). Determinar durante qué años el número de miles de roedores se sitúa entre 535 y 579.

1) Along the intervals of years: [3.03605,7.16457] and [8.47538,9.36756].

2) Along the interval of years: [4.,7.3096].

3) Along the intervals of years: [6,7] and [8.8541,9.4641].

4) Along the intervals of years: [5.,6.38194] and [9.40761,10.].

5) Along the interval of years: [3.,5.].

6) Along the interval of years: [3.40575,4.26969].

7) Along the interval of years: [3.,9.27805].

8) Along the intervals of years: [3,6], [7,8.8541] and [9.4641,10].

Exercise 8

Compute the limit: $\lim_{x\to\infty} 8 - 6x - x^2 + 9x^3$

1) -9

2) ∞

3) 0

4) 1

5) -8

6) $-\infty$

7) -6

Exercise 9

A factory produces certain type of devices. The marginal cost (cost of producing one unit) decreases when we produce a large amount of units and it is given by the function $C(x) = \frac{2 + 5x + 7x^2}{2 + 6x + 7x^2 + 8x^3 + 2x^4}$. Determine the expected cost per unit when a large amount of units is produced.

1) 17000

2) $-\frac{2}{7}$

3) $-\frac{2}{3}$

4) $-\infty$

5) $-\frac{3}{8}$

6) ∞

7) 0

Exercise 10

The population in certain turistic area increases exponentially and is given by the function $P(t) = 88000\, e^{t/100}$ that indicates the number of resident citizens for every year t. At the same time, depending on the season, the city receives a variable number of tourists given by the trigonometric function $I(t) = 3000 + 1000 \,\mathrm{Sin}\left[\frac{t}{2\pi}\right]$ that yields the amount of visitors in the area for every moment t (t in years). Determine how many years are necessary until the total nomber of habitants is 119000. (the solution can be found for t between 25 and 30).

1) t=**.0****

2) t=**.2****

3) t=**.4****

4) t=**.6****

5) t=**.8****

Exercise 11

Study the continuity of the function $f(x)=\begin{cases} -e^{x-3}-\sin(3-x) & x\leq 3 \\ 2\log(x-2)-1 & 3<x<6 \\ -3\sin(6-x)-2\cos(6-x) & 6\leq x \end{cases}$

1) The functions is continuous for all points.

2) The functions is not continuous at any point.

3) The function is continuous for all the points except for x=3.

4) The function is continuous for all the points except for x=6.

5) The function is continuous for all the points except for x=3 and x=6.

Mathematics 1 - ADE/FyCo - 2020/2021
List of exercises 01-Functions for identity number: 20902651249

Exercise 1

We have two bank accounts, the first in the bank A and the second in the bank B. In the bank A we obtain a continuous compound rate of 4% and in the bank B we are paid a periodic compound interes rate of 7% in 9 periods (compounding frequency). We initially deposit 14 000 euros in the bank A and 2000 in B. How long time is it necessary until the money in both accounts is exactly the same?

Remark: To obtain a correct answer it is necessary to work with at least 5 decimal digits.

1) In **4.***** years.

2) In **0.***** years.

3) In **6.***** years.

4) In **3.***** years.

5) In **5.***** years.

Exercise 2

Certain parcel of land is revalued from an initial value of 223 000 euros until a final value of 466 000 euros along 5 years. Determine the rate of continuous compound interes for that revaluation.

Remark: To obtain a correct answer it is necessary to work with at least 5 decimal digits.

1) The interest rate is **1.*****%.

2) The interest rate is **4.*****%.

3) The interest rate is **7.*****%.

4) The interest rate is **8.*****%.

5) The interest rate is **0.*****%.

Exercise 3

We have a bank account that initially offers a continuous compound rate of 5%, and after 4 years the conditions are modified and then we obtain a continuous compound rate of 6%. The initial deposit is 14 000 euros. Compute the amount of money in the account after 7 years from the moment of the first deposit.

1) We will have ****5.***** euros.

2) We will have ****1.***** euros.

3) We will have ****7.***** euros.

4) We will have ****4.***** euros.

5) We will have ****6.***** euros.

Exercise 4

A firm sells Q tons of certain product. The price received per ton is given by the formula P=6000−4Q. On the other hand, the production cost per ton is C=4000+9Q. In addition, the transportation cost is 1402 per ton. Compute the maximum profit that can be obtained selling this product.

1) Profit=4061.

2) Profit=3795.

3) Profit=2314.

4) Profit=3195.

5) Profit=6877.

Exercise 5

Deposits in certain investment account vary from year to year alternating gains and looses periods. We have the following data about the deposits for different years:

year	deposits
1	23
2	45
4	77

By means of a interpolation polynomial, obtain the function that yields the deposits in the account for every year t. Employ that function to determine the maximum funds available in the investment account.

1) The maximum for the depositis in the account was 19.

2) The maximum for the depositis in the account was 95.

3) The maximum for the depositis in the account was 7.

4) The maximum for the depositis in the account was 12.

5) The maximum for the depositis in the account was −9.

Exercise 6

The funds of a public institution alternate periods of deficit and surplus. We have the following information for several years (in millions of euros):

year	funds
2	14
5	32
9	112

Employ an interpolation polynomial to build a function that yields the funds for each year t. We know that due to the legislation the funds of such an institution have to be kept between 64 and 86. Compute (by means of the polynomial obtained before by interpolation) the periods along which the funds are between the indicated limits inside the interval of time where we have information (that is to say, from t=2 to t=9).

1) The funds are inside the limits for the inverval: [7,9].

2) The funds are inside the limits for the inverval: [7,8].

3) The funds are inside the limits for the inverval: [-4,0].

4) The funds are inside the limits for the intervals: [-4,-3] y [8,9].

5) The funds are inside the limits for the inverval: [-4,7].

6) The funds are inside the limits for the inverval: [-4,-3].

7) The funds are inside the limits for the inverval: [0,7].

8) The funds are inside the limits for the inverval: [-4,9].

Exercise 7

The population of a city is studied between years t=4 and t=10. In that period the population is given by the function $P(t)=8+648\,t-90\,t^2+4\,t^3$. Determine the intervals of years when the population is between 1480 and 1506.

1) Along the interval of years: [5.42126,7.12332].

2) Along the intervals of years: [4,4.68826], [5.18826,7], [8,9.81174] and [10,10].

3) Along the interval of years: [4.31474,10.].

4) Along the intervals of years: [4.04198,5.] and [6.,10.6156].

5) Along the intervals of years: [4.30681,7.06881] and [8.,10.3508].

6) Along the interval of years: [5.,8.78553].

7) Along the interval of years: [4.,7.20308].

8) Along the intervals of years: [4.68826,5.18826], [7,8] and [9.81174,10].

Exercise 8

Compute the limit: $\lim_{x\to\infty}\left(\frac{-2+7x+x^2}{-7-2x+x^2}\right)^{-7-3x+9x^2}$

1) 1

2) $-\infty$

3) $\frac{1}{e^3}$

4) $\frac{1}{e^2}$

5) ∞

6) $\frac{1}{e^4}$

7) 0

Exercise 9

The population of certain country (in millions of habitants) is given by the function $P(t) = 39\left(\frac{6+t+8t^2}{-7-7t+8t^2}\right)^{8+2t}$. Determine the future tendency for this population.

1) $39\,e^2$

2) $-\infty$

3) $\frac{39}{e^5}$

4) ∞

5) 39

6) 0

7) $39\,e$

Exercise 10

The population in certain turistic area increases exponentially and is given by the function $P(t)=65000\,e^{t/100}$ that indicates the number of resident citizens for every year t. At the same time, depending on the season, the city receives a variable number of tourists given by the trigonometric function $I(t)=5000+1000\,\text{Sin}\left[\frac{t}{2\pi}\right]$ that yields the amount of visitors in the area for every moment t (t in years). Determine how many years are necessary until the total nomber of habitants is 99000. (the solution can be found for t between 34 and 39).

1) t=**.0****

2) t=**.2****

3) t=**.4****

4) t=**.6****

5) t=**.8****

Exercise 11

Study the continuity of the function $f(x)=\begin{cases} -2\,e^{x+2} & x\le -2 \\ -\log(x+3)-2 & -2<x<0 \end{cases}$

1) The functions is continuous for all points.

2) The functions is not continuous at any point.

3) The function is continuous for all the points except for x=-2.

4) The function is continuous for all the points except for x=0.

5) The function is continuous for all the points except for x=-2 and x=0.

Mathematics 1 - ADE/FyCo - 2020/2021
List of exercises 01-Functions for identity number: 21130550766

Exercise 1

We have two bank accounts, the first in the bank A and the second in the bank B. In the bank A we obtain a continuous compound rate of 2% and in the bank B we are paid a periodic compound interes rate of 6% in 6 periods (compounding frequency). We initially deposit 8000 euros in the bank A and 3000 in B. How long time is it necessary until the money in both accounts is exactly the same?

Remark: To obtain a correct answer it is necessary to work with at least 5 decimal digits.

1) In **4.***** years.

2) In **5.***** years.

3) In **3.***** years.

4) In **0.***** years.

5) In **7.***** years.

Exercise 2

We have one bank account that offers a compound interes rate of 4% where we initially deposit 12000 euros. How long time is it necessary until the amount of money in the account reaches 14000 euros?

Remark: To obtain a correct answer it is necessary to work with at least 5 decimal digits.

1) In **4.***** years.

2) In **0.***** years.

3) In **5.***** years.

4) In **3.***** years.

5) In **8.***** years.

Exercise 3

We have a bank account that initially offers a compound interes rate of 7%, and after 4 years the conditions are modified and then we obtain a compound interes rate of 10%. The initial deposit is 8000 euros. Compute the amount of money in the account after 4 years from the moment of the first deposit.

1) We will have ****0.***** euros.

2) We will have ****5.***** euros.

3) We will have ****6.***** euros.

4) We will have ****3.***** euros.

5) We will have ****4.***** euros.

Exercise 4

A firm sells Q tons of certain product. The price received per ton is given by the formula P=4000-9Q. On the other hand, the production cost per ton is C=1000-6Q. In addition, the transportation cost is 2784 per ton. Compute the maximum profit that can be obtained selling this product.

1) Profit=5499.

2) Profit=4972.

3) Profit=2271.

4) Profit=4235.

5) Profit=3888.

Exercise 5

Deposits in certain investment account vary from year to year alternating gains and looses periods. We have the following data about the deposits for different years:

year	deposits
0	2
2	-6
4	-30

By means of a interpolation polynomial, obtain the function that yields the deposits in the account for every year t. Employ that function to forecast the exact amount for year 6.

1) The depositis in the account for year 6 are 13.

2) The depositis in the account for year 6 are -70.

3) The depositis in the account for year 6 are -5.

4) The depositis in the account for year 6 are 0.

5) The depositis in the account for year 6 are -96.

Exercise 6

The funds of a public institution alternate periods of deficit and surplus. We have the following information for several years (in millions of euros):

year	funds
0	1
4	-47
7	-146

Employ an interpolation polynomial to build a function that yields the funds for each year t. We know that due to the legislation the funds of such an institution have to be kept between -74 and -2. Compute (by means of the polynomial obtained before by interpolation) the periods along which the funds are between the indicated limits inside the interval of time where we have information (that is to say, from t=0 to t=7).

1) The funds are inside the limits for the inverval: [-5,-1].

2) The funds are inside the limits for the inverval: [1,5].

3) The funds are inside the limits for the inverval: [-1,0].

4) The funds are inside the limits for the inverval: [5,7].

5) The funds are inside the limits for the inverval: [-1,5].

6) The funds are inside the limits for the intervals: [-5,-1] y [1,7].

7) The funds are inside the limits for the inverval: [0,5].

8) The funds are inside the limits for the inverval: [-1,7].

Exercise 7

Se realiza un estudio para analizar la población de cierto tipo de roedores en una comarca entre los años t=1 y t=10. En ese período la población viene dada por la función $P(t) = 7 + 504\,t - 78\,t^2 + 4\,t^3$ (en miles de roedores). Determinar durante qué años el número de miles de roedores se sitúa entre 925 y 1735.

1) Along the interval of years: [3,10].

2) Along the interval of years: [8.00956,10.6053].

3) Along the interval of years: [4.04097,9.].

4) Along the intervals of years: [1,3] and [10,10].

5) Along the intervals of years: [2.58362,3.46392] and [9.4506,10.6444].

6) Along the interval of years: [6.,7.].

7) Along the intervals of years: [1.,2.] and [5.,9.50555].

8) Along the intervals of years: [1.5441,2.35987] and [6.,8.41492].

Exercise 8

Compute the limit: $\lim_{x\to\infty}\left(\frac{9+5x-6x^2}{8+6x-6x^2}\right)^{-5+8x}$

1) $e^{4/3}$

2) $\frac{1}{e^4}$

3) $\frac{1}{e^5}$

4) 1

5) 0

6) ∞

7) $-\infty$

Exercise 9

From an initial deposit 13000, the interest rate varies every year in such a way that the total amount of money in the account is given by the function $C(t) = 13\,000\left(\frac{5-6t-3t^2}{-3-8t-3t^2}\right)^{-1+t}$. Determine the future tendency for the deposits that we will have after a large number of years.

1) 0

2) $\frac{13\,000}{e^{167/250}}$

3) 13 000

4) $-\infty$

5) ∞

6) $\frac{13\,000}{e^{2/3}}$

7) $\frac{13\,000}{e^2}$

Exercise 10

We deposit 16000 euros in a bank account with a compound interes rate of 10%. At the same time every year we also add in a safe-deposit box (therefore with no interest rate) 5000 euros. How long time is it necessary until the total ammount of money (jointly in the bank account and safe-depsit box) is 56000 euros? (the solution can be found for t between 1 and 6).

1) t=**.0****

2) t=**.2****

3) t=**.4****

4) t=**.6****

5) t=**.8****

Exercise 11

Study the continuity of the function $f(x) = \begin{cases} \sin(x) - \cos(x) & x \leq 0 \\ -1 & 0 < x < 3 \\ \sin(3 - x) - e^{x-3} & 3 \leq x \end{cases}$

1) The functions is continuous for all points.

2) The functions is not continuous at any point.

3) The function is continuous for all the points except for x=0.

4) The function is continuous for all the points except for x=3.

5) The function is continuous for all the points except for x=0 and x=3.

Mathematics 1 - ADE/FyCo - 2020/2021
List of exercises 01-Functions for identity number: 30216550613

Exercise 1

We have two bank accounts, the first in the bank A and the second in the bank B. In the bank A we obtain a compound interes rate of 6% and in the bank B we are paid a periodic compound interes rate of 9% in 10 periods (compounding frequency). We initially deposit 13 000 euros in the bank A and 1000 in B. How long time is it necessary until the money in both accounts is exactly the same?

Remark: To obtain a correct answer it is necessary to work with at least 5 decimal digits.

1) In **0.***** years.

2) In **6.***** years.

3) In **4.***** years.

4) In **1.***** years.

5) In **3.***** years.

Exercise 2

Certain parcel of land is devalued from an initial value of 357 000 euros until a final value of 162 000 euros along 10 years. Determine the rate of continuous compound interes for that devaluation.

Remark: To obtain a correct answer it is necessary to work with at least 5 decimal digits.

1) The interest rate is **3.*****%.

2) The interest rate is **9.*****%.

3) The interest rate is **7.*****%.

4) The interest rate is **8.*****%.

5) The interest rate is **2.*****%.

Exercise 3

We have a bank account that initially offers a compound interes rate of 1%, and after 4 years the conditions are modified and then we obtain a continuous compound rate of 9%. The initial deposit is 13 000 euros. Compute the amount of money in the account after 7 years from the moment of the first deposit.

1) We will have ****1.***** euros.

2) We will have ****8.***** euros.

3) We will have ****7.***** euros.

4) We will have ****0.***** euros.

5) We will have ****3.***** euros.

Exercise 4

A firm sells Q tons of certain product. The price received per ton is given by the formula P=13000−4Q. On the other hand, the production cost per ton is C=4000+4Q. In addition, the transportation cost is 8872 per ton. Compute the maximum profit that can be obtained selling this product.

1) Profit=246.

2) Profit=512.

3) Profit=683.

4) Profit=585.

5) Profit=208.

Exercise 5

Deposits in certain investment account vary from year to year alternating gains and looses periods. We have the following data about the deposits for different years:

year	deposits
0	50
1	32
2	18

By means of a interpolation polynomial, obtain the function that yields the deposits in the account for every year t. Employ that function to determine the minimum funds available in the investment account.

1) The minimum for the depositis in the account was 2.

2) The minimum for the depositis in the account was −10.

3) The minimum for the depositis in the account was 5.

4) The minimum for the depositis in the account was 19.

5) The minimum for the depositis in the account was 0.

Exercise 6

The funds of a public institution alternate periods of deficit and surplus. We have the following information for several years (in millions of euros):

year	funds
2	25
6	73
8	121

Employ an interpolation polynomial to build a function that yields the funds for each year t. We know that due to the legislation the funds of such an institution have to be kept between 14 and 31 . Compute (by means of the polynomial obtained before by interpolation) the periods along which the funds are between the indicated limits inside the interval of time where we have information (that is to say, from t=2 to t=8).

1) The funds are inside the limits for the inverval: [8,8].

2) The funds are inside the limits for the inverval: [0,3].

3) The funds are inside the limits for the inverval: [-1,8].

4) The funds are inside the limits for the inverval: [2,3].

5) The funds are inside the limits for the inverval: [0,8].

6) The funds are inside the limits for the inverval: [3,8].

7) The funds are inside the limits for the inverval: [-2,9].

8) The funds are inside the limits for the inverval: [-1,3].

Exercise 7

Se realiza un estudio para analizar la población de cierto tipo de roedores en una comarca entre los años t=2 y t=7. En ese período la población viene dada por la función $P(t) = 10 + 180\,t - 48\,t^2 + 4\,t^3$ (en miles de roedores). Determinar durante qué años el número de miles de roedores se sitúa entre 210 y 426.

1) Along the intervals of years: [3.13505,4.55362] and [5.08377,6.].

2) Along the intervals of years: [2.,4.07971] and [5.74169,6.18998].

3) Along the interval of years: [2,7].

4) Along the interval of years: [3.,4.].

5) Along the intervals of years: [2.62193,3.13863] and [4.,7.].

6) Along the intervals of years: [2,2], [5,5] and [7,7].

7) Along the intervals of years: [3.55607,5.50989] and [6.,7.].

8) Along the interval of years: [3.14418,7.34469].

Exercise 8

Compute the limit: $\lim_{x\to-\infty}\left(\frac{8-9x-4x^2}{-4-9x-4x^2}\right)^{-8+2x+2x^2}$

1) $\frac{1}{e^4}$

2) 0

3) 1

4) $-\infty$

5) $\frac{1}{e^5}$

6) $\frac{1}{e^6}$

7) ∞

Exercise 9

From an initial deposit 3000, the interest rate varies every year in such a way that the total amount of money in the account is given by the function $C(t) = 3000\left(\frac{9-2t-2t^2}{-1-6t-2t^2}\right)^{-3+2t}$. Determine the future tendency for the deposits that we will have after a large number of years.

1) $-\infty$

2) 0

3) $\frac{3000}{e^4}$

4) $\frac{3000}{e^{2001/500}}$

5) ∞

6) $\frac{3000}{e^3}$

7) 3000

Exercise 10

The population in certain turistic area increases exponentially and is given by the function $P(t)=70\,000\, e^{t/100}$ that indicates the number of resident citizens for every year t. At the same time, depending on the season, the city receives a variable number of tourists given by the trigonometric function $I(t)=2000+1000\,\mathrm{Sin}\left[\frac{t}{2\pi}\right]$ that yields the amount of visitors in the area for every moment t (t in years). Determine how many years are necessary until the total nomber of habitants is 99000. (the solution can be found for t between 31 and 36).

1) t=**.0****

2) t=**.2****

3) t=**.4****

4) t=**.6****

5) t=**.8****

Exercise 11

Study the continuity of the function $f(x)=\begin{cases} -\sin(3-x) & x\le 3 \\ 2\log(x-2) & 3<x<4 \\ 1-3\log(x-3) & 4\le x \end{cases}$

1) The functions is continuous for all points.

2) The functions is not continuous at any point.

3) The function is continuous for all the points except for x=3.

4) The function is continuous for all the points except for x=4.

5) The function is continuous for all the points except for x=3 and x=4.

Mathematics 1 - ADE/FyCo - 2020/2021
List of exercises 01-Functions for identity number: 30312650522

Exercise 1

We have two bank accounts, the first in the bank A and the second in the bank B. In the bank A we obtain a periodic compound interes rate of 9% in 2 periods (compounding frequency) and in the bank B we are paid a continuous compound rate of 1%. We initially deposit 4000 euros in the bank A and 14 000 in B. How long time is it necessary until the money in both accounts is exactly the same?

Remark: To obtain a correct answer it is necessary to work with at least 5 decimal digits.

1) In **8.***** years.

2) In **6.***** years.

3) In **0.***** years.

4) In **3.***** years.

5) In **9.***** years.

Exercise 2

Certain parcel of land is devalued from an initial value of 220 000 euros until a final value of 107 000 euros along 10 years. Determine the rate of compound interes for that devaluation.

Remark: To obtain a correct answer it is necessary to work with at least 5 decimal digits.

1) The interest rate is **3.*****%.

2) The interest rate is **6.*****%.

3) The interest rate is **1.*****%.

4) The interest rate is **9.*****%.

5) The interest rate is **0.*****%.

Exercise 3

We have a bank account that initially offers a continuous compound rate of 3%, and after 1 year the conditions are modified and then we obtain a continuous compound rate of 5%. The initial deposit is 14 000 euros. Compute the amount of money in the account after 5 years from the moment of the first deposit.

1) We will have ****4.***** euros.

2) We will have ****8.***** euros.

3) We will have ****3.***** euros.

4) We will have ****0.***** euros.

5) We will have ****5.***** euros.

Exercise 4

A firm sells Q tons of certain product. The price received per ton is given by the formula P=9000-16Q. On the other hand, the production cost per ton is C=4000+Q. In addition, the transportation cost is 4150 per ton. Compute the maximum profit that can be obtained selling this product.

1) Profit=10 625.

2) Profit=4425.

3) Profit=6130.

4) Profit=16 589.

5) Profit=5056.

Exercise 5

Deposits in certain investment account vary from year to year alternating gains and looses periods. We have the following data about the deposits for different years:

year	deposits
1	5
3	5
5	-11

By means of a interpolation polynomial, obtain the function that yields the deposits in the account for every year t. Employ that function to determine the maximum funds available in the investment account.

1) The maximum for the depositis in the account was -43.

2) The maximum for the depositis in the account was 7.

3) The maximum for the depositis in the account was 2.

4) The maximum for the depositis in the account was -10.

5) The maximum for the depositis in the account was 4.

Exercise 6

The funds of a public institution alternate periods of deficit and surplus. We have the following information for several years (in millions of euros):

year	funds
2	3
5	9
9	73

Employ an interpolation polynomial to build a function that yields the funds for each year t. We know that due to the legislation the funds of such an institution have to be kept between 3 and 19 . Compute (by means of the polynomial obtained before by interpolation) the periods along which the funds are between the indicated limits inside the interval of time where we have information (that is to say, from t=2 to t=9).

1) The funds are inside the limits for the inverval: [4,9].

2) The funds are inside the limits for the inverval: [0,0].

3) The funds are inside the limits for the intervals: [0,2] y [6,9].

4) The funds are inside the limits for the intervals: [2,2] y [4,6].

5) The funds are inside the limits for the inverval: [0,9].

6) The funds are inside the limits for the inverval: [0,2].

7) The funds are inside the limits for the intervals: [0,2] y [4,6].

8) The funds are inside the limits for the inverval: [0,4].

Exercise 7

Se realiza un estudio para analizar la población de cierto tipo de roedores en una comarca entre los años t=4 y t=10. En ese período la población viene dada por la función $P(t) = 5 + 420\,t - 72\,t^2 + 4\,t^3$ (en miles de roedores). Determinar durante qué años el número de miles de roedores se sitúa entre 725 y 869.

1) Along the interval of years: [4,9].

2) Along the interval of years: [4.46066,10.6571].

3) Along the intervals of years: [4,4] and [9,10].

4) Along the intervals of years: [4.,5.67633] and [8.27821,10.].

5) Along the intervals of years: [4.,5.24998] and [6.02669,7.32776].

6) Along the intervals of years: [6.,7.] and [8.71831,10.3885].

7) Along the interval of years: [7.64408,9.79374].

8) Along the intervals of years: [4.,6.] and [7.44098,8.16498].

Exercise 8

Compute the limit: $\lim_{x \to -\infty} -6 - 4x - x^2 - 6x^3$

1) -5

2) -4

3) 0

4) $-\infty$

5) 1

6) ∞

7) -8

Exercise 9

The population of certain country (in millions of habitants) is given by the function $P(t) = 21\left(\frac{-2-5t-t^2}{7+6t-t^2}\right)^{7-3t+9t^2}$. Determine the future tendency for this population.

1) ∞

2) $\frac{21}{e^5}$

3) $\frac{21}{e}$

4) 21

5) $-\infty$

6) $\frac{21}{e^2}$

7) 0

Exercise 10

The population in certain turistic area increases exponentially and is given by the function $P(t) = 65000\, e^{t/100}$ that indicates the number of resident citizens for every year t. At the same time, depending on the season, the city receives a variable number of tourists given by the trigonometric function $I(t) = 2000 + 1000\,\mathrm{Sin}\left[\frac{t}{2\pi}\right]$ that yields the amount of visitors in the area for every moment t (t in years). Determine how many years are necessary until the total nomber of habitants is 107000. (the solution can be found for t between 44 and 49).

1) t=**.0****

2) t=**.2****

3) t=**.4****

4) t=**.6****

5) t=**.8****

Exercise 11

Study the continuity of the function $f(x)=\begin{cases} -2\,e^{x+2}-3\sin(x+2) & x\leq -2 \\ x+1 & -2<x<-1 \end{cases}$

1) The functions is continuous for all points.

2) The functions is not continuous at any point.

3) The function is continuous for all the points except for $x=-2$.

4) The function is continuous for all the points except for $x=-1$.

5) The function is continuous for all the points except for $x=-2$ and $x=-1$.

Mathematics 1 - ADE/FyCo - 2020/2021
List of exercises 01-Functions for identity number: 30509500045

Exercise 1

We have two bank accounts, the first in the bank A and the second in the bank B. In the bank A we obtain a periodic compound interes rate of 9% in 7 periods (compounding frequency) and in the bank B we are paid a compound interes rate of 3% . We initially deposit 3000 euros in the bank A and 12 000 in B. How long time is it necessary until the money in both accounts is exactly the same?

Remark: To obtain a correct answer it is necessary to work with at least 5 decimal digits.

1) In **9.***** years.

2) In **6.***** years.

3) In **3.***** years.

4) In **0.***** years.

5) In **4.***** years.

Exercise 2

We have one bank account that offers a periodic compound interes rate of 2% in 6 periods (compounding frequency) where we initially deposit 14 000 euros. How long time is it necessary until the amount of money in the account reaches 20 000 euros?

Remark: To obtain a correct answer it is necessary to work with at least 5 decimal digits.

1) In **0.***** years.

2) In **1.***** years.

3) In **5.***** years.

4) In **7.***** years.

5) In **9.***** years.

Exercise 3

We have a bank account that initially offers a continuous compound rate of 5%, and after 2 years the conditions are modified and then we obtain a continuous compound rate of 4% . The initial deposit is 12 000 euros. Compute the amount of money in the account after 10 years from the moment of the first deposit.

1) We will have ****1.***** euros.

2) We will have ****4.***** euros.

3) We will have ****5.***** euros.

4) We will have ****3.***** euros.

5) We will have ****9.***** euros.

Exercise 4

A firm sells Q tons of certain product. The price received per ton is given by the formula P=20000−16Q. On the other hand, the production cost per ton is C=10000+2Q. In addition, the transportation cost is 8956 per ton. Compute the maximum profit that can be obtained selling this product.

1) Profit=9315.

2) Profit=6803.

3) Profit=23 011.

4) Profit=24 073.

5) Profit=15 138.

Exercise 5

Deposits in certain investment account vary from year to year alternating gains and looses periods. We have the following data about the deposits for different years:

year	deposits
2	−5
3	−11
4	−19

By means of a interpolation polynomial, obtain the function that yields the deposits in the account for every year t. Employ that function to forecast the exact amount for year 6.

1) The depositis in the account for year 6 are 6.

2) The depositis in the account for year 6 are −55.

3) The depositis in the account for year 6 are −1.

4) The depositis in the account for year 6 are −41.

5) The depositis in the account for year 6 are 1.

Exercise 6

The funds of a public institution alternate periods of deficit and surplus. We have the following information for several years (in millions of euros):

year	funds
1	7
4	31
6	57

Employ an interpolation polynomial to build a function that yields the funds for each year t. We know that due to the legislation the funds of such an institution have to be kept between 21 and 31. Compute (by means of the polynomial obtained before by interpolation) the periods along which the funds are between the indicated limits inside the interval of time where we have information (that is to say, from t=1 to t=6).

1) The funds are inside the limits for the inverval: [3,4].

2) The funds are inside the limits for the inverval: [-7,3].

3) The funds are inside the limits for the inverval: [-7,6].

4) The funds are inside the limits for the inverval: [-7,0].

5) The funds are inside the limits for the inverval: [-7,-6].

6) The funds are inside the limits for the inverval: [3,6].

7) The funds are inside the limits for the intervals: [-7,-6] y [4,6].

8) The funds are inside the limits for the inverval: [0,3].

Exercise 7

Se realiza un estudio para analizar la población de cierto tipo de roedores en una comarca entre los años t=3 y t=9. En ese período la población viene dada por la función $P(t) = 9 + 504\,t - 78\,t^2 + 4\,t^3$ (en miles de roedores). Determinar durante qué años el número de miles de roedores se sitúa entre 1079 y 1097.

1) Along the interval of years: [5,8].

2) Along the intervals of years: [3.00543,5.] and [6.,9.].

3) Along the intervals of years: [3,5] and [8,9].

4) Along the interval of years: [6.,9.33746].

5) Along the interval of years: [7.,8.26571].

6) Along the intervals of years: [4.49159,5.04727] and [8.,9.54845].

7) Along the intervals of years: [3.32611,4.] and [5.,9.70029].

8) Along the intervals of years: [3.5833,6.58351] and [8.07979,9.6673].

Exercise 8

Compute the limit: $\lim_{x\to\infty} \frac{4 + x + 7 x^2 - 9 x^3}{-1 - 5 x - 4 x^2 - 7 x^3}$

1) 1

2) $-\infty$

3) -1

4) 0

5) $-\frac{3}{7}$

6) ∞

7) $\frac{9}{7}$

Exercise 9

From an initial deposit 6000, the interest rate varies every year in such a way that the total amount of money in the account is given by the function $C(t) = 6000 \left(\frac{-9 + 7 t + 5 t^2}{3 - 6 t + 5 t^2}\right)^{7+t}$. Determine the future tendency for the deposits that we will have after a large number of years.

1) $6000\, e^{13/5}$

2) $\frac{6000}{e^5}$

3) $\frac{6000}{e^3}$

4) 6000

5) ∞

6) $-\infty$

7) 0

Exercise 10

We deposit 5000 euros in a bank account with a periodic compound interes rate of 8% in 5 periods (compounding frequency). At the same time every year we also add in a safe-deposit box (therefore with no interest rate) 4000 euros. How long time is it necessary until the total ammount of money (jointly in the bank account and safe-depsit box) is 47000 euros? (the solution can be found for t between 5 and 10).

1) t=**.1****

2) t=**.3****

3) t=**.5****

4) t=**.7****

5) t=**.9****

Exercise 11

Study the continuity of the function $f(x) = \begin{cases} 0 & x \le -1 \\ 1 - x & -1 < x < 1 \\ \sin(1 - x) & 1 \le x \end{cases}$

1) The functions is continuous for all points.

2) The functions is not continuous at any point.

3) The function is continuous for all the points except for $x = -1$.

4) The function is continuous for all the points except for $x = 1$.

5) The function is continuous for all the points except for $x = -1$ and $x = 1$.