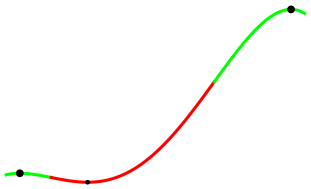
Mathematics 1 - ADE/FyCo - 2020/2021
List of exercises 02-Derivatives for identity number: 113

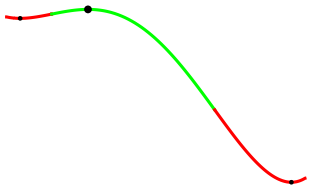
Exercise 1

Study the shape properties of the $f(x)=3+480\,x+120\,x^2-120\,x^3-15\,x^4+12\,x^5$ to decide which amongst the following ones is the representation of the function.

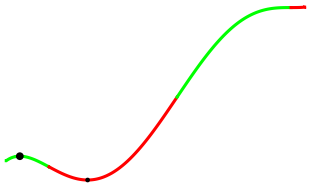
1)



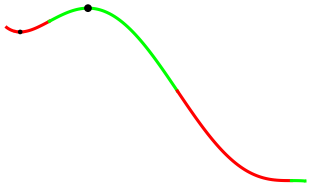
2)



3)



4)



 Big point: maximum

 Small point: minimum

 Red line: convexity

 Green line: concavity

Indication: To find the maximun and minimum points of the function, try (with Ruffini) the points -2, -1, 0, 1, 2. To solve this exercise it is necessary to determine the increasing and decreasing intervals.

Exercise 2

Determine the derivative of the function $f(t)=-\log(t+1)+\sin(t)+2$ and compute its value at the point $t=0$.

1) $f'(0)=-2$ 2) $f'(0)=0$ 3) $f'(0)=-4$ 4) $f'(0)=2$

Exercise 3

Compute the limit: $\lim_{x\to 1}\dfrac{\frac{11}{3}-6\,x+3\,x^2-\frac{2\,x^3}{3}+\text{Log}\left[x^2\right]}{1-4\,x+6\,x^2-4\,x^3+x^4}$

1) ∞

2) 1

3) -1

4) -2

5) $-\infty$

6) $-\dfrac{1}{2}$

7) 0

Exercise 4

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

1) -2

2) $-\infty$

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

4) 0

5) 1

6) ∞

7) -1

Exercise 5

Between the months $t=3$ and $t=10$, the funds in certain account (in millions of euros) are given by the function $F(t) = -4 + 210t - 36t^2 + 2t^3$.

Determine the interval where the temperature oscillates between the months $t=6$ and $t=10$.

1) It oscillates between 385 and 489.

2) It oscillates between 388 and 396.

3) It oscillates between 356 and 496.

4) It oscillates between 387 and 489.

5) It oscillates between 388 and 496.

Exercise 6

In a fish farm, data of precedings years reveal that, if the initial number of fishes is x (x in thousands), after one month they reproduce until a number of $f(x) = \frac{16x}{4 + 48x}$ fishes.

What number of fishes leads to the largest increase in the number of animals, $f(x) - x$?

1) $\frac{29}{9}$

2) $\frac{37}{17}$

3) 14

4) $\frac{7}{16}$

5) $\frac{1}{12}$

Exercise 7

The yield of a tree plantation is given by $f(x) = \frac{-38 + 37x + 18x^2}{13x^2}$, where x is the distance in meters between two trees.

What is the distance x that leads to the largest yield.

1) 8

2) $\frac{35}{2}$

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

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

5) $\frac{76}{37}$

Exercise 8

Study the differentiability of the function $f(x) =$

$$\begin{cases} -\cos(x+2) - 2 & x \le -2 \\ 2x - 2e^{x+2} + 2e(x+2) - 2x\sin(1) - 2\cos(x+2) + 5 - 4\sin(1) & -2 < x < -1 \\ 3\cos(x+1) - 2\left(-e^{x+1} + 1 + \sin(1) + \cos(1)\right) & -1 \le x \end{cases}$$

1) The function is differentiable for all points.

2) The function is not differentiable at any point.

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

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

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

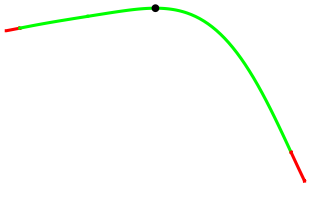
Mathematics 1 - ADE/FyCo - 2020/2021
List of exercises 02-Derivatives for identity number: 4501

Exercise 1

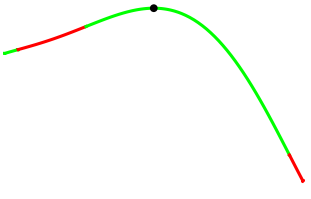
Study the shape properties of $f(x)=2-24x^2-8x^3+x^4+\frac{3x^5}{5}$

to decide which amongst the following ones is the representation of the function.

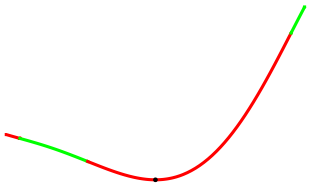
1)



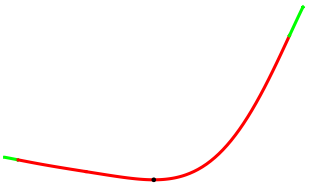
2)



3)



4)



● Big point: maximum

• Small point: minimum

Red line: convexity

Green line: concavity

Indication: To solve this exercise it is necessary to determine the concavity and convexity interval. To find the inflexion points separating the cancavity and convexity intervals, check (by means of Ruffini) with the points −2, −1, 0, 1, 2.

Exercise 2

Determine the derivative of the function $f(t)=\sin(t)-\log(t+1)$ and compute its value at the point t=0.

1) $f'(0)=0$ 2) $f'(0)=-4$ 3) $f'(0)=-1$ 4) $f'(0)=4$

Exercise 3

Compute the limit: $\lim_{x \to 0} \frac{-x + \text{Sin}[x]}{x^2}$

1) ∞

2) -1

3) 1

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

5) $-\infty$

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

7) 0

Exercise 4

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

1) -1

2) $-\infty$

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

4) 1

5) 0

6) ∞

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

Exercise 5

Between the months $t=3$ and $t=7$, the true value of the shares of a company (in euros) are given by the function $C(t) = 231 + 144t - 30t^2 + 2t^3$.

Determine the interval where the value oscillates between the months $t=4$ and $t=7$.

1) It oscillates between 440 and 448.

2) It oscillates between 447 and 455.

3) It oscillates between 448 and 459.

4) It oscillates between 457 and 448.

5) It oscillates between 452 and 446.

Exercise 6

In a fish farm, data of precedings years reveal that, if the initial number of fishes is x (x in thousands), after one month they reproduce until a number of $f(x)=\frac{16\,x}{1+33\,x}$ fishes.

What number of fishes leads to the largest increase in the number of animals, $f(x)-x$?

1) $\frac{17}{20}$

2) 2

3) $\frac{4}{7}$

4) 2

5) $\frac{1}{11}$

Exercise 7

The yield of a tree plantation is given by $f(x)=\frac{-34+26\,x+9\,x^2}{22\,x^4}$, where x is the distance in meters between two trees.

What is the distance x that leads to the largest yield.

1) $\frac{5}{17}$

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

3) $\frac{20}{7}$

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

5) $\frac{39}{8}$

Exercise 8

Study the differentiability of the function $f(x)=\begin{cases} -e^{x+2}-\cos(x+2)-3 & x\le -2 \\ x\sin(3)+\cos(x+2)-6+2\sin(3) & -2<x<1 \\ -\cos(1-x)+3\sin(3)+\cos(3) & 1\le x \end{cases}$

1) The function is differentiable for all points.

2) The function is not differentiable at any point.

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

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

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

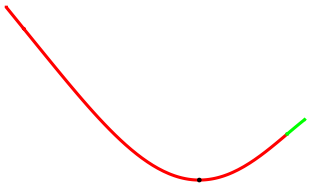
Mathematics 1 - ADE/FyCo - 2020/2021
List of exercises 02-Derivatives for identity number: 187462

Exercise 1

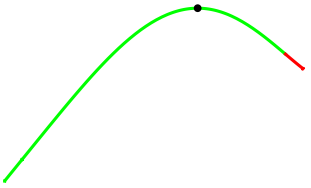
Study the shape properties of $f(x)=1-24\,x^2+3\,x^4+\frac{3\,x^5}{5}$

to decide which amongst the following ones is the representation of the function.

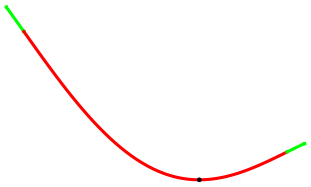
1)



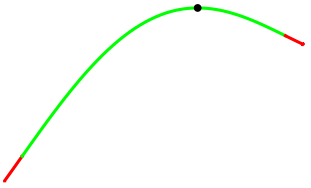
2)



3)



4)



● Big point: maximum

• Small point: minimum

Red line: convexity

Green line: concavity

Indication: To solve this exercise it is necessary to determine the concavity and convexity interval. To find the inflexion points separating the cancavity and convexity intervals, check (by means of Ruffini) with the points −2, −1, 0, 1, 2.

Exercise 2

Determine the derivative of the function $f(t)=3\sin(\sin(t))+\cos(t)+2$ and compute its value at the point t=0.

1) $f'(0)=4$ 2) $f'(0)=-3$ 3) $f'(0)=-4$ 4) $f'(0)=3$

Exercise 3

Compute the limit: $\lim_{x \to 0} \frac{-1 + e^{x^3} - x^3}{x^4}$

1) -1

2) -2

3) ∞

4) 0

5) $-\infty$

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

7) 1

Exercise 4

Compute the limit: $\lim_{x \to -3} \frac{54 + 81\,x + 45\,x^2 + 11\,x^3 + x^4}{9 + 15\,x + 7\,x^2 + x^3}$

1) ∞

2) 1

3) $-\infty$

4) -2

5) 0

6) -1

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

Exercise 5

Between the months t=1 and t=8
, the true value of the shares of a company (in euros) are given by the function $C(t) = 328 + 48\,t - 27\,t^2 + 2\,t^3$.

Determine the interval where the value oscillates between the months t=3 and t=6.

1) It oscillates between 8 and 351.

2) It oscillates between 76 and 283.

3) It oscillates between 82 and 284.

4) It oscillates between 8 and 351.

5) It oscillates between 73 and 280.

Exercise 6

In a fish farm, data of precedings years reveal that, if the initial number of fishes is x (x in thousands), after one month they reproduce until a number of $f(x)=\frac{4x}{1+35x}$ fishes.

What number of fishes leads to the largest increase in the number of animals, $f(x)-x$?

1) $\frac{22}{7}$

2) $\frac{1}{35}$

3) $\frac{39}{8}$

4) $\frac{1}{3}$

5) $\frac{1}{12}$

Exercise 7

The yield of a tree plantation is given by $f(x)=\frac{-27+14x+33x^2}{9x^4}$, where x is the distance in meters between two trees.

What is the distance x that leads to the largest yield.

1) $\frac{3}{10}$

2) 9

3) 1

4) $\frac{10}{7}$

5) $\frac{36}{17}$

Exercise 8

Study the differentiability of the function $f(x)=$

$$\begin{cases} e^{x+2}-\cos(x+2)-3 & x\le -2 \\ 2x-e^{x+2}+\cos(x+2)+1 & -2<x<-1 \\ 3x-3(x+2)\log(x+2)-e+2+\cos(1) & -1\le x \end{cases}$$

1) The function is differentiable for all points.

2) The function is not differentiable at any point.

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

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

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

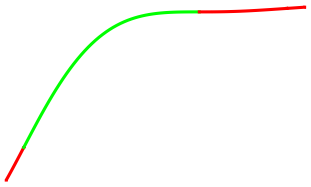
Mathematics 1 - ADE/FyCo - 2020/2021
List of exercises 02-Derivatives for identity number: 550273

Exercise 1

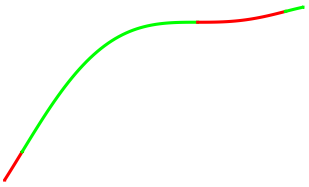
Study the shape properties of $f(x)=4-4x^3+x^4+\frac{3x^5}{5}$

to decide which amongst the following ones is the representation of the function.

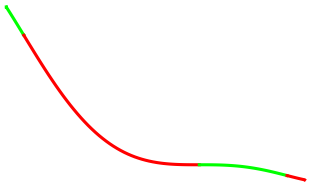
1)



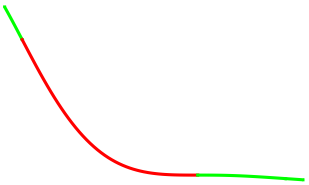
2)



3)



4)



● Big point: maximum

• Small point: minimum

Red line: convexity

Green line: concavity

Indication: To solve this exercise it is necessary to determine the concavity and convexity interval. To find the inflexion points separating the cancavity and convexity intervals, check (by means of Ruffini) with the points −2, −1, 0, 1, 2.

Exercise 2

Determine the derivative of the function $f(t)=t^3+\left(e^t-\sin(t)\right)\cos(t)$ and compute its value at the point t=0.

1) f'(0)=0 2) f'(0)=−4 3) f'(0)=−3 4) f'(0)=4

Exercise 3

Compute the limit: $\lim_{x \to 0} \frac{-x + \text{Sin}[x]}{x^3}$

1) -1

2) $-\frac{1}{6}$

3) 0

4) 1

5) ∞

6) $-\infty$

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

Exercise 4

Compute the limit: $\lim_{x \to 1} \frac{-1 + x^2}{-x + x^2}$

1) 2

2) $-\infty$

3) -2

4) 0

5) ∞

6) -1

7) 1

Exercise 5

Between the months $t=1$ and $t=8$, the true value of the shares of a company (in euros) are given by the function $C(t) = 52 + 84\,t - 27\,t^2 + 2\,t^3$.

Determine the interval where the value oscillates between the months $t=3$ and $t=6$.

1) It oscillates between 3 and 128.

2) It oscillates between 17 and 113.

3) It oscillates between 16 and 115.

4) It oscillates between 7 and 118.

5) It oscillates between 3 and 128.

Exercise 6

In a fish farm, data of precedings years reveal that, if the initial number of fishes is x (x in thousands), after one month they reproduce until a number of $f(x)=\frac{27\,x}{12+22\,x}$ fishes.

What number of fishes leads to the largest increase in the number of animals, $f(x)-x$?

1) $\frac{17}{10}$

2) 1

3) 11

4) $\frac{11}{8}$

5) $\frac{3}{11}$

Exercise 7

The yield of a tree plantation is given by $f(x)=\frac{-28+7\,x+14\,x^2}{48\,x^7}$, where x is the distance in meters between two trees.

What is the distance x that leads to the largest yield.

1) $\frac{7}{5}$

2) $\frac{38}{11}$

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

4) 29

5) $\frac{24}{7}$

Exercise 8

Study the differentiability of the function $f(x)=\begin{cases} 2\,e^{x-1} & x\le 1 \\ \frac{1}{4}\,((14-3\,x)\,x-3) & 1<x<3 \\ 2\,x-3\,(x-2)\log(x-2)-3 & 3\le x \end{cases}$

1) The function is differentiable for all points.

2) The function is not differentiable at any point.

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

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

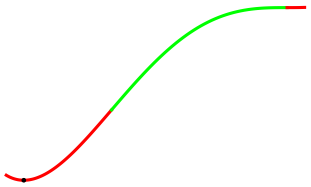
5) The function is differentiable for all points except for x=1 and x=3.

Mathematics 1 - ADE/FyCo - 2020/2021
List of exercises 02-Derivatives for identity number: 2959749

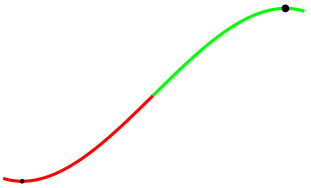
Exercise 1

Study the shape properties of the $f(x)=3+48\,x-12\,x^3+3\,x^4$
to decide which amongst the following ones is the representation of the function.

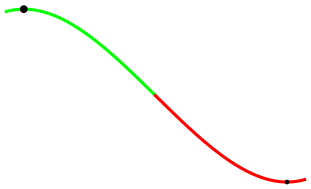
1)



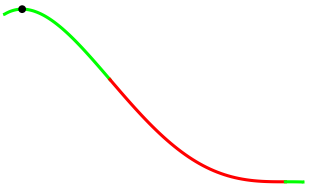
2)



3)



4)



● Big point: maximum

• Small point: minimum

Red line: convexity

Green line: concavity

Indication: To find the maximun and minimum points of the function,
try (with Ruffini) the points −2, −1, 0, 1, 2. To solve this exercise
it is necessary to determine the increasing and decreasing intervals.

Exercise 2

Determine the derivative of the function $f(t)=\left(-e^t+\log(t+1)+2\right)\sin(t)$ and compute its value at the point t=0.

1) $f'(0)=-2$ 2) $f'(0)=1$ 3) $f'(0)=0$ 4) $f'(0)=3$

Exercise 3

Compute the limit: $\lim_{x\to 0}\dfrac{-1+\frac{x^2}{2}+\cos[x]}{x^4}$

1) -2

2) 0

3) 1

4) ∞

5) $-\infty$

6) -1

7) $\dfrac{1}{24}$

Exercise 4

Compute the limit: $\lim_{x \to 1} \frac{1 - x - x^2 + x^3}{-3 + 2x + x^2}$

1) $-\frac{1}{3}$

2) 1

3) 0

4) -1

5) -2

6) ∞

7) $-\infty$

Exercise 5

Between the months $t=0$ and $t=7$, the funds in certain account (in millions of euros) are given by the function $F(t) = -16 + 60t - 21t^2 + 2t^3$.

Determine the interval where the temperature oscillates between the months $t=4$ and $t=6$.

1) It oscillates between 9 and 20.

2) It oscillates between 9 and 36.

3) It oscillates between 15 and 10.

4) It oscillates between 10 and 24.

5) It oscillates between -16 and 61.

Exercise 6

In a fish farm, data of precedings years reveal that, if the initial number of fishes is x (x in thousands), after one month they reproduce until a number of $f(x) = \frac{18x}{8 + 25x}$ fishes.

What number of fishes leads to the largest increase in the number of animals, $f(x) - x$?

1) $\frac{33}{4}$

2) $\frac{4}{25}$

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

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

5) $\frac{9}{10}$

Exercise 7

The yield of a tree plantation is given by $f(x) = \frac{-21 + 49\,x + 7\,x^2}{17\,x^2}$, where x is the distance in meters between two trees.

What is the distance x that leads to the largest yield.

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

2) 2

3) $\frac{37}{20}$

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

5) $\frac{6}{7}$

Exercise 8

Study the differentiability of the function $f(x) = \begin{cases} -\sin(x+1) - 2\cos(x+1) + 5 & x \le -1 \\ 3 - \sin(x+1) & -1 < x < 1 \\ 2\,e^{x-1} + 3\cos(1-x) - 2 - \sin(2) & 1 \le x \end{cases}$

1) The function is differentiable for all points.

2) The function is not differentiable at any point.

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

4) The function is differentiable for all points except for $x=1$.

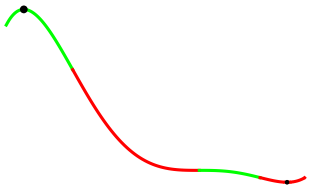
5) The function is differentiable for all points except for $x=-1$ and $x=1$.

Mathematics 1 - ADE/FyCo - 2020/2021
List of exercises 02-Derivatives for identity number: 3180328

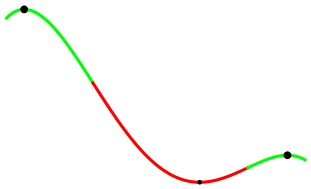
Exercise 1

Study the shape properties of the $f(x) = 2 - 40\,x^3 + 15\,x^4 + 12\,x^5$
to decide which amongst the following ones is the representation of the function.

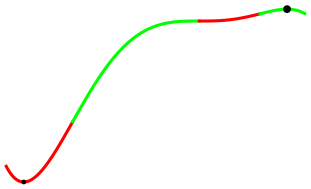
1)



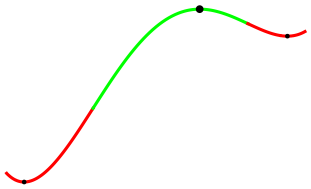
2)



3)



4)



● Big point: maximum

• Small point: minimum

—— Red line: convexity

—— Green line: concavity

Indication: To find the maximun and minimum points of the function,
try (with Ruffini) the points −2, −1, 0, 1, 2. To solve this exercise
it is necessary to determine the increasing and decreasing intervals.

Exercise 2

Determine the derivative of the function $f(t) =$
$2\,t^4 \sin(t) \cos(t)$ and compute its value at the point $t=0$.

1) $f'(0)=0$ 2) $f'(0)=3$ 3) $f'(0)=2$ 4) $f'(0)=-4$

Exercise 3

Compute the limit: $\lim_{x\to 0}\frac{-1+\frac{x^4}{2}+\cos\left[x^2\right]}{x^5}$

1) ∞

2) -2

3) 1

4) 0

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

6) $-\infty$

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

Exercise 4

Compute the limit: $\lim_{x\to -2}\frac{24+44\,x+30\,x^2+9\,x^3+x^4}{-4+3\,x^2+x^3}$

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

2) 0

3) $-\infty$

4) -2

5) 1

6) ∞

7) -1

Exercise 5

Between the months t=3 and t=10 , the funds in certain account (in millions of euros) are given by the function $F(t)=252\,t-39\,t^2+2\,t^3$.

Determine the interval where the temperature oscillates between the months t=5 and t=6.

1) It oscillates between 535 and 542.

2) It oscillates between 535 and 540.

3) It oscillates between 543 and 544.

4) It oscillates between 539 and 540.

5) It oscillates between 459 and 620.

Exercise 6

In a fish farm, data of precedings years reveal that, if the initial number of fishes is x (x in thousands), after one month they reproduce until a number of $f(x)=\frac{20\,x}{5+23\,x}$ fishes.

What number of fishes leads to the largest increase in the number of animals, $f(x)-x$?

1) $\frac{12}{17}$

2) $\frac{36}{11}$

3) $\frac{5}{23}$

4) $\frac{23}{16}$

5) $\frac{15}{8}$

Exercise 7

The yield of a tree plantation is given by $f(x)=\frac{-39+4\,x+45\,x^2}{16\,x^2}$, where x is the distance in meters between two trees.

What is the distance x that leads to the largest yield.

1) $\frac{8}{13}$

2) $\frac{14}{9}$

3) 1

4) $\frac{39}{2}$

5) $\frac{13}{3}$

Exercise 8

Study the differentiability of the function $f(x)=\begin{cases} -2\sin(2-x)-3\cos(2-x)+4 & x\le 2 \\ 1 & 2<x<4 \\ 2\cos(4-x) & 4\le x \end{cases}$

1) The function is differentiable for all points.

2) The function is not differentiable at any point.

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

4) The function is differentiable for all points except for x=4.

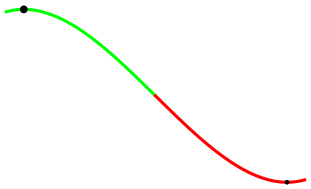
5) The function is differentiable for all points except for x=2 and x=4.

Mathematics 1 - ADE/FyCo - 2020/2021
List of exercises 02-Derivatives for identity number: 6548030

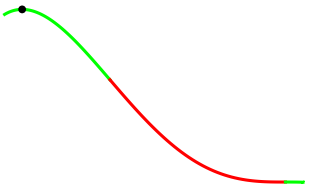
Exercise 1

Study the shape properties of the $f(x)=1+48x-12x^3+3x^4$
to decide which amongst the following ones is the representation of the function.

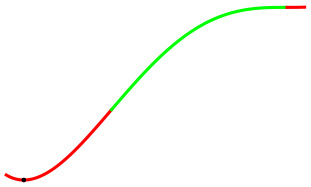
1)



2)



3)



4)

● Big point: maximum

• Small point: minimum

Red line: convexity

Green line: concavity

Indication: To find the maximun and minimum points of the function,
try (with Ruffini) the points −2, −1, 0, 1, 2. To solve this exercise
it is necessary to determine the increasing and decreasing intervals.

Exercise 2

Determine the derivative of the function $f(t)=$
$e^t+\sin(t)+\cos(t)+1$ and compute its value at the point t=0.

1) $f'(0)=2$ 2) $f'(0)=0$ 3) $f'(0)=1$ 4) $f'(0)=-1$

Exercise 3

Compute the limit: $\lim_{x\to 0}\frac{-x+\text{Sin}[x]}{x^3}$

1) -1

2) $-\infty$

3) 1

4) $-\frac{1}{6}$

5) -2

6) 0

7) ∞

Exercise 4

Compute the limit: $\lim_{x \to 1} \frac{-3 + 7x - 5x^2 + x^3}{3 - 5x + x^2 + x^3}$

1) $-\infty$

2) -1

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

4) -2

5) 1

6) 0

7) ∞

Exercise 5

Between the months $t=0$ and $t=7$, the funds in certain account (in millions of euros) are given by the function $F(t) = -18 - 9t^2 + 2t^3$.

Determine the interval where the temperature oscillates between the months $t=2$ and $t=3$.

1) It oscillates between -52 and -38.

2) It oscillates between -45 and 227.

3) It oscillates between -45 and -18.

4) It oscillates between -45 and -38.

5) It oscillates between -42 and -48.

Exercise 6

In a fish farm, data of precedings years reveal that, if the initial number of fishes is x (x in thousands), after one month they reproduce until a number of $f(x) = \frac{18x}{2 + 17x}$ fishes.

What number of fishes leads to the largest increase in the number of animals, $f(x) - x$?

1) $\frac{10}{3}$

2) $\frac{9}{13}$

3) 24

4) $\frac{4}{17}$

5) $\frac{2}{5}$

Exercise 7

The yield of a tree plantation is given by $f(x) = \frac{-22 + 11x + 39x^2}{13x^2}$, where x is the distance in meters between two trees.

What is the distance x that leads to the largest yield.

1) $\frac{18}{17}$

2) $\frac{13}{3}$

3) 4

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

5) $\frac{5}{19}$

Exercise 8

Study the differentiability of the function $f(x) =$

$$\begin{cases} -\sin(x+1) - \cos(x+1) - 5 & x \le -1 \\ e\,x - e^{x+1} + x\left(\sin(1) - 1\right) + \cos(x+1) + e - 7 + \sin(1) & -1 < x < 0 \\ -\sin(x) + 2\cos(x) - 9 + \sin(1) + \cos(1) & 0 \le x \end{cases}$$

1) The function is differentiable for all points.

2) The function is not differentiable at any point.

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

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

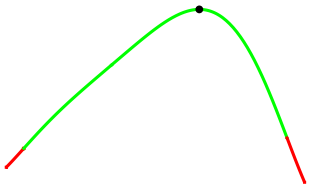
5) The function is differentiable for all points except for $x=-1$ and $x=0$.

Mathematics 1 - ADE/FyCo - 2020/2021
List of exercises 02-Derivatives for identity number: 7511947

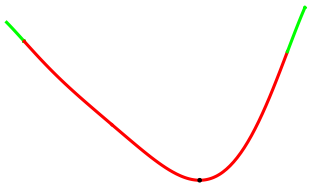
Exercise 1

Study the shape properties of $f(x)=5-60\,x^2-30\,x^3+5\,x^4+9\,x^5+2\,x^6$
to decide which amongst the following ones is the representation of the function.

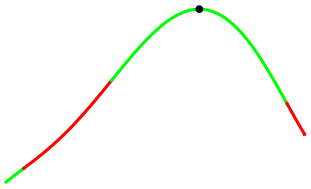
1)



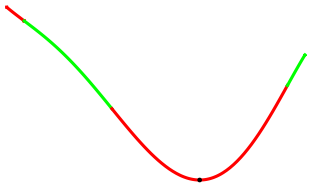
2)



3)



4)



● Big point: maximum

• Small point: minimum

Red line: convexity

Green line: concavity

Indication: To solve this exercise it is necessary to determine the concavity and convexity interval. To find the inflexion points separating the cancavity and convexity intervals, check (by means of Ruffini) with the points −2, −1, 0, 1, 2.

Exercise 2

Determine the derivative of the function $f(t)=-\cos(t)$ and compute its value at the point $t=0$.

1) $f'(0)=2$ 2) $f'(0)=0$ 3) $f'(0)=-1$ 4) $f'(0)=-4$

Exercise 3

Compute the limit: $\lim_{x \to 0} \frac{-1 + \frac{x^2}{2} + \text{Cos}[x]}{x^3}$

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

2) 1

3) ∞

4) -2

5) 0

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

7) $-\infty$

Exercise 4

Compute the limit: $\lim_{x \to -1} \frac{x + x^2}{-1 + x^2}$

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

2) 1

3) -2

4) 0

5) -1

6) ∞

7) $-\infty$

Exercise 5

Between the months t=0 and t=5 , the true value of the shares of a company (in euros) are given by the function $C(t) = 57 + 30\,t - 18\,t^2 + 2\,t^3$.

Determine the interval where the value oscillates between the months t=0 and t=2.

1) It oscillates between 57 and 71.

2) It oscillates between 50 and 77.

3) It oscillates between 7 and 71.

4) It oscillates between 7 and 71.

5) It oscillates between 50 and 81.

Exercise 6

In a fish farm, data of precedings years reveal that, if the initial number of fishes is x (x in thousands), after one month they reproduce until a number of $f(x)=\frac{20\,x}{5+31\,x}$ fishes.

What number of fishes leads to the largest increase in the number of animals, f(x)−x?

1) $\frac{10}{19}$

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

3) $\frac{3}{20}$

4) 11

5) $\frac{5}{31}$

Exercise 7

The yield of a tree plantation is given by $f(x)=\frac{-40+17\,x+27\,x^2}{19\,x^7}$, where x is the distance in meters between two trees.

What is the distance x that leads to the largest yield.

1) $\frac{7}{19}$

2) 2

3) $\frac{37}{10}$

4) $\frac{28}{13}$

5) $\frac{10}{9}$

Exercise 8

Study the differentiability of the function $f(x)=\begin{cases} 2\,e^{x-1}+3\sin(1)\sin(x)+3\cos(1)\cos(x)+5 & x\le 1 \\ -x^2+4\,x+7 & 1<x<3 \\ x-(x-2)\log(x-2)+7 & 3\le x \end{cases}$

1) The function is differentiable for all points.

2) The function is not differentiable at any point.

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

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

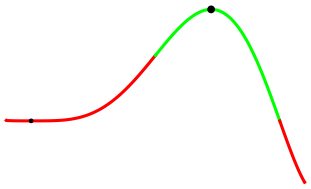
5) The function is differentiable for all points except for x=1 and x=3.

Mathematics 1 - ADE/FyCo - 2020/2021
List of exercises 02-Derivatives for identity number: 7803104

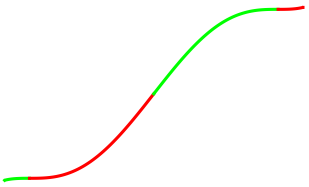
Exercise 1

Study the shape properties of $f(x)=5+10\,x^4-9\,x^5+2\,x^6$
to decide which amongst the following ones is the representation of the function.

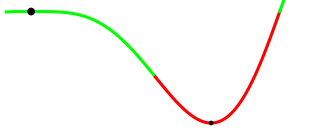
1)



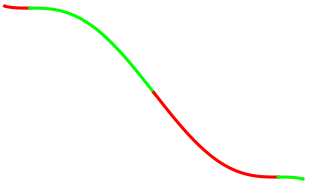
2)



3)



4)



● Big point: maximum

• Small point: minimum

Red line: convexity

Green line: concavity

Indication: To solve this exercise it is necessary to determine the concavity and convexity interval. To find the inflexion points separating the cancavity and convexity intervals, check (by means of Ruffini) with the points −2, −1, 0, 1, 2.

Exercise 2

Determine the derivative of the function $f(t)=$
$t^3-3\sin(t)\cos\left(\sin(t)\right)$ and compute its value at the point t=0.

1) $f'(0)=4$ 2) $f'(0)=2$ 3) $f'(0)=3$ 4) $f'(0)=-3$

Exercise 3

Compute the limit: $\lim_{x \to 0} \frac{-1 + \cos\left[x^3\right]}{x^4}$

1) 0

2) 1

3) −1

4) $\frac{1}{3}$

5) ∞

6) −∞

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

Exercise 4

Compute the limit: $\lim_{x \to -1} \frac{-1 + x^2}{2 + 3x + x^2}$

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

2) −2

3) −∞

4) −1

5) 1

6) 0

7) ∞

Exercise 5

Between the months t=3 and t=10
, the true value of the shares of a company (in euros) are given by the function $C(t) = 399 + 210\,t - 36\,t^2 + 2\,t^3$.

Determine the interval where the value oscillates between the months t=4 and t=10.

1) It oscillates between 791 and 899.

2) It oscillates between 791 and 799.

3) It oscillates between 800 and 897.

4) It oscillates between 790 and 898.

5) It oscillates between 759 and 899.

Exercise 6

In a fish farm, data of precedings years reveal that, if the initial number of fishes is x (x in thousands), after one month they reproduce until a number of $f(x)=\frac{49\,x}{36+42\,x}$ fishes.

What number of fishes leads to the largest increase in the number of animals, $f(x)-x$?

1) $\frac{12}{5}$

2) 5

3) $\frac{1}{7}$

4) $\frac{23}{13}$

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

Exercise 7

The yield of a tree plantation is given by $f(x)=\frac{-15+33\,x+41\,x^2}{25\,x^9}$, where x is the distance in meters between two trees.

What is the distance x that leads to the largest yield.

1) $\frac{8}{9}$

2) $\frac{15}{41}$

3) $\frac{31}{10}$

4) $\frac{11}{13}$

5) $\frac{20}{19}$

Exercise 8

Study the differentiability of the function $f(x)=$

$$\begin{cases} 2\left(e^{x-3}+\sin(3)\sin(x)+\cos(3)\cos(x)-1\right) & x\le 3 \\ \frac{1}{4}\left(-3x^2+26x-43\right) & 3<x<5 \\ -e^{x-5}+2\cos(5-x)+4 & 5\le x \end{cases}$$

1) The function is differentiable for all points.

2) The function is not differentiable at any point.

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

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

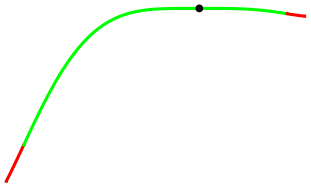
5) The function is differentiable for all points except for x=3 and x=5.

Mathematics 1 - ADE/FyCo - 2020/2021
List of exercises 02-Derivatives for identity number: 8623226

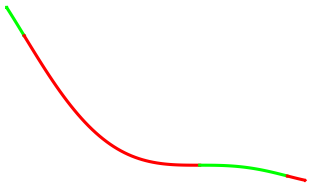
Exercise 1

Study the shape properties of $f(x)=5-10\,x^4+3\,x^5+2\,x^6$
to decide which amongst the following ones is the representation of the function.

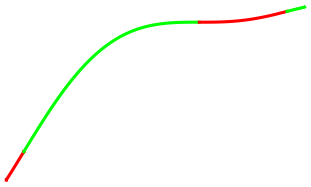
1)



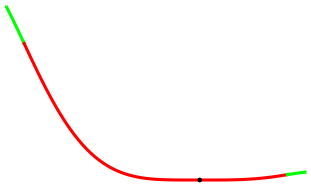
2)



3)



4)



 Big point: maximum

 Small point: minimum

 Red line: convexity

 Green line: concavity

Indication: To solve this exercise it is necessary to determine the concavity and convexity interval. To find the inflexion points separating the cancavity and convexity intervals, check (by means of Ruffini) with the points -2, -1, 0, 1, 2.

Exercise 2

Determine the derivative of the function $f(t)=\log(t+1)-t^2\sin(t)\cos(t)$ and compute its value at the point $t=0$.

1) $f'(0)=1$ 2) $f'(0)=-4$ 3) $f'(0)=-3$ 4) $f'(0)=3$

Exercise 3

Compute the limit: $\lim_{x\to 0}\dfrac{-1+\cos[x]}{x^2}$

1) 0

2) 1

3) $-\dfrac{1}{2}$

4) -1

5) $-\dfrac{2}{3}$

6) ∞

7) $-\infty$

Exercise 4

Compute the limit: $\lim_{x \to 1} \frac{-1 + x^2}{-x + x^2}$

1) 1

2) −1

3) −2

4) ∞

5) 0

6) −∞

7) 2

Exercise 5

Between the months t=1 and t=8 , the true value of the shares of a company (in euros) are given by the function $C(t) = -3 + 48\,t - 18\,t^2 + 2\,t^3$.

Determine the interval where the value oscillates between the months t=6 and t=8.

1) It oscillates between 69 and 253.

2) It oscillates between 29 and 37.

3) It oscillates between 78 and 262.

4) It oscillates between 60 and 263.

5) It oscillates between 29 and 253.

Exercise 6

In a fish farm, data of precedings years reveal that, if the initial number of fishes is x (x in thousands), after one month they reproduce until a number of $f(x) = \frac{36\,x}{16 + 40\,x}$ fishes.

What number of fishes leads to the largest increase in the number of animals, f(x)−x?

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

2) $\frac{11}{15}$

3) $\frac{17}{7}$

4) $\frac{27}{17}$

5) $\frac{5}{6}$

Exercise 7

The yield of a tree plantation is given by $f(x) = \frac{-48 + 36\,x + 24\,x^2}{5\,x^7}$, where x is the distance in meters between two trees.

What is the distance x that leads to the largest yield.

1) $\frac{3}{2}$

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

3) 1

4) $\frac{21}{2}$

5) $\frac{11}{9}$

Exercise 8

Study the differentiability of the function $f(x) =$

$$\begin{cases} 2\,e^{x-1} & x \le 1 \\ -\sin(1-x) + \cos(1-x) + x\left(-2 + \sin(2) - \cos(2)\right) + 3 - \sin(2) + \cos(2) & 1 < x < 3 \\ -2\,e^{x-3} + 3\cos(3-x) - 2 + 3\sin(2) - \cos(2) & 3 \le x \end{cases}$$

1) The function is differentiable for all points.

2) The function is not differentiable at any point.

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

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

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

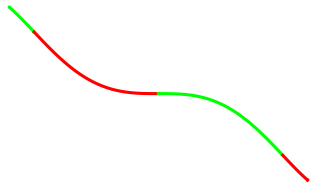
Mathematics 1 - ADE/FyCo - 2020/2021
List of exercises 02-Derivatives for identity number: 8792788

Exercise 1

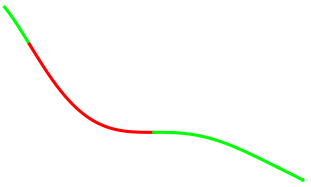
Study the shape properties of $f(x)=2-2x^3+\frac{3x^5}{5}$

to decide which amongst the following ones is the representation of the function.

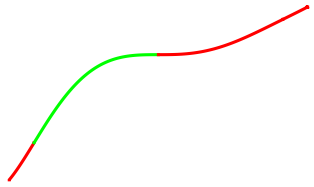
1)



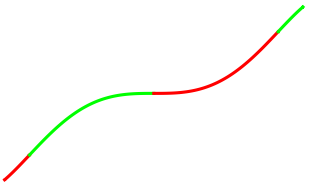
2)



3)



4)



● Big point: maximum

• Small point: minimum

—— Red line: convexity

—— Green line: concavity

Indication: To solve this exercise it is necessary to determine the concavity and convexity interval. To find the inflexion points separating the cancavity and convexity intervals, check (by means of Ruffini) with the points −2, −1, 0, 1, 2.

Exercise 2

Determine the derivative of the function $f(t)=\sin(\sin(\sin(t)))-2\log(\sin(\sin(t))+1)$ and compute its value at the point t=0.

1) $f'(0)=-4$ 2) $f'(0)=-1$ 3) $f'(0)=4$ 4) $f'(0)=-2$

Exercise 3

Compute the limit: $\lim_{x\to 0}\frac{-1+\frac{x^4}{2}+\text{Cos}\left[x^2\right]}{x^5}$

1) 0

2) 1

3) −1

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

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

6) $-\infty$

7) ∞

Exercise 4

Compute the limit: $\lim_{x\to -1}\frac{3+4x+x^2}{-1+x^2}$

1) −2

2) ∞

3) −1

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

5) 1

6) $-\infty$

7) 0

Exercise 5

Between the months t=0 and t=5 , the true value of the shares of a company (in euros) are given by the function $C(t)=10+72t-21t^2+2t^3$.

Determine the interval where the value oscillates between the months t=0 and t=4.

1) It oscillates between 10 and 91.

2) It oscillates between 10 and 93.

3) It oscillates between 20 and 87.

4) It oscillates between 10 and 95.

5) It oscillates between 90 and 91.

Exercise 6

In a fish farm, data of precedings years reveal that, if the initial number of fishes is x (x in thousands), after one month they reproduce until a number of $f(x)=\frac{16\,x}{4+x}$ fishes.

What number of fishes leads to the largest increase in the number of animals, $f(x)-x$?

1) 1

2) 3

3) 4

4) $\frac{5}{3}$

5) $\frac{7}{19}$

Exercise 7

The yield of a tree plantation is given by $f(x)=\frac{-9+44\,x+12\,x^2}{28\,x^8}$, where x is the distance in meters between two trees.

What is the distance x that leads to the largest yield.

1) $\frac{5}{17}$

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

3) $\frac{18}{5}$

4) $\frac{1}{3}$

5) $\frac{35}{19}$

Exercise 8

Study the differentiability of the function $f(x)=\begin{cases} -2\,e^{x-2}-3\sin(2)\sin(x)-3\cos(2)\cos(x)-4 & x\le 2 \\ x^2-6\,x-1 & 2<x<4 \\ -2\sin(4-x)-9 & 4\le x \end{cases}$

1) The function is differentiable for all points.

2) The function is not differentiable at any point.

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

4) The function is differentiable for all points except for x=4.

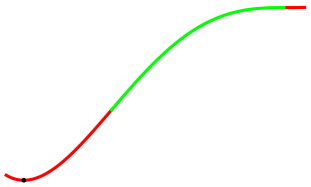
5) The function is differentiable for all points except for x=2 and x=4.

Mathematics 1 - ADE/FyCo - 2020/2021
List of exercises 02-Derivatives for identity number: 9214549

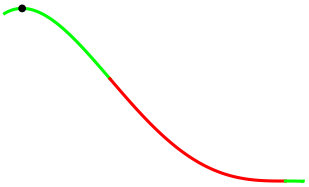
Exercise 1

Study the shape properties of the $f(x) = 5 - 12x - 3x^2 + 2x^3$
to decide which amongst the following ones is the representation of the function.

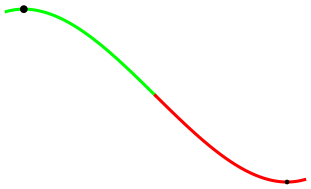
1)



2)



3)



4)

● Big point: maximum

• Small point: minimum

Red line: convexity

Green line: concavity

Indication: To find the maximun and minimum points of the function,
try (with Ruffini) the points −2, −1, 0, 1, 2. To solve this exercise
it is necessary to determine the increasing and decreasing intervals.

Exercise 2

Determine the derivative of the function $f(t) =$
$-e^t \cos(t) \cos(\log(t+1))$ and compute its value at the point t=0.

1) $f'(0) = 3$ 2) $f'(0) = 4$ 3) $f'(0) = -1$ 4) $f'(0) = -2$

Exercise 3

Compute the limit: $\lim_{x \to 0} \frac{-x + \frac{x^3}{6} + \text{Sin}[x]}{x^4}$

1) -1

2) -2

3) 1

4) $-\infty$

5) ∞

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

7) 0

Exercise 4

Compute the limit: $\lim_{x \to -1} \frac{-2 - 3x + x^3}{-1 + x^2}$

1) 1

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

3) $-\infty$

4) ∞

5) -2

6) -1

7) 0

Exercise 5

Between the months t=3 and t=9 , the funds in certain account (in millions of euros) are given by the function $F(t) = -17 + 180\,t - 33\,t^2 + 2\,t^3$.

Determine the interval where the temperature oscillates between the months t=5 and t=8.

1) It oscillates between 280 and 388.

2) It oscillates between 307 and 335.

3) It oscillates between 307 and 308.

4) It oscillates between 313 and 325.

5) It oscillates between 302 and 332.

Exercise 6

In a fish farm, data of precedings years reveal that, if the initial number of fishes is x (x in thousands), after one month they reproduce until a number of $f(x) = \frac{18x}{2 + 45x}$ fishes.

What number of fishes leads to the largest increase in the number of animals, $f(x) - x$?

1) $\frac{4}{19}$

2) 4

3) $\frac{4}{45}$

4) $\frac{17}{7}$

5) $\frac{8}{5}$

Exercise 7

The yield of a tree plantation is given by $f(x) = \frac{-42 + 43x + 49x^2}{20x^2}$, where x is the distance in meters between two trees.

What is the distance x that leads to the largest yield.

1) $\frac{33}{17}$

2) $\frac{27}{20}$

3) $\frac{8}{5}$

4) $\frac{84}{43}$

5) 14

Exercise 8

Study the differentiability of the function $f(x) = \begin{cases} -\sin(x+3) + 2\cos(x+3) - 1 & x \le -3 \\ -\frac{1}{4}x(x+10) - \frac{13}{4} & -3 < x < -1 \\ -4x + 2(x+2)\log(x+2) - 5 & -1 \le x \end{cases}$

1) The function is differentiable for all points.

2) The function is not differentiable at any point.

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

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

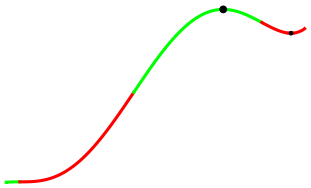
5) The function is differentiable for all points except for $x=-3$ and $x=-1$.

Mathematics 1 - ADE/FyCo - 2020/2021
List of exercises 02-Derivatives for identity number: 9810258

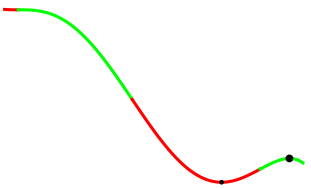
Exercise 1

Study the shape properties of the $f(x) = 3 + 480\,x - 120\,x^2 - 120\,x^3 + 15\,x^4 + 12\,x^5$ to decide which amongst the following ones is the representation of the function.

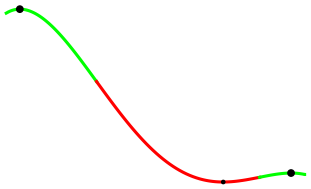
1)



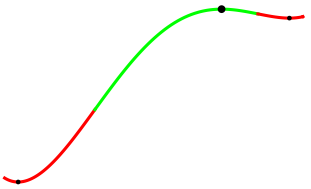
2)



3)



4)



● Big point: maximum

• Small point: minimum

Red line: convexity

Green line: concavity

Indication: To find the maximun and minimum points of the function, try (with Ruffini) the points −2, −1, 0, 1, 2. To solve this exercise it is necessary to determine the increasing and decreasing intervals.

Exercise 2

Determine the derivative of the function $f(t) = e^t + 3\log(t+1)$ and compute its value at the point t=0.

1) $f'(0) = 1$ 2) $f'(0) = 0$ 3) $f'(0) = 4$ 4) $f'(0) = -4$

Exercise 3

Compute the limit: $\lim_{x \to 0} \frac{-1 + \cos\left[x^2\right]}{x^4}$

1) $-\infty$

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

3) ∞

4) -1

5) 1

6) 0

7) $-\frac{1}{3}$

Exercise 4

Compute the limit: $\lim_{x \to 2} \frac{-12 + 16\,x - 7\,x^2 + x^3}{-2 - x + x^2}$

1) $-\infty$

2) -1

3) 1

4) 0

5) $-\frac{1}{3}$

6) -2

7) ∞

Exercise 5

Between the months t=2 and t=8
, the funds in certain account (in millions of euros) are given by the function $F(t) = -13 + 180\,t - 33\,t^2 + 2\,t^3$.

Determine the interval where the temperature oscillates between the months t=2 and t=4.

1) It oscillates between 231 and 307.

2) It oscillates between 224 and 299.

3) It oscillates between 239 and 298.

4) It oscillates between 231 and 339.

5) It oscillates between 311 and 312.

Exercise 6

In a fish farm, data of precedings years reveal that, if the initial number of fishes is x (x in thousands), after one month they reproduce until a number of $f(x)=\frac{50\,x}{32+38\,x}$ fishes.

What number of fishes leads to the largest increase in the number of animals, $f(x)-x$?

1) $\frac{32}{17}$

2) 30

3) $\frac{4}{19}$

4) $\frac{31}{11}$

5) $\frac{17}{14}$

Exercise 7

The yield of a tree plantation is given by $f(x)=\frac{-23+24\,x+45\,x^2}{50\,x^2}$, where x is the distance in meters between two trees.

What is the distance x that leads to the largest yield.

1) $\frac{32}{17}$

2) 25

3) $\frac{23}{12}$

4) $\frac{20}{3}$

5) $\frac{17}{14}$

Exercise 8

Study the differentiability of the function $f(x)=\begin{cases} 3-\cos(1-x) & x\le 1 \\ x\left(\log\left(\frac{x}{3}\right)-2\right)+4+\log(3) & 1<x<3 \\ -(x-2)\log(x-2)-2+\log(3) & 3\le x \end{cases}$

1) The function is differentiable for all points.

2) The function is not differentiable at any point.

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

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

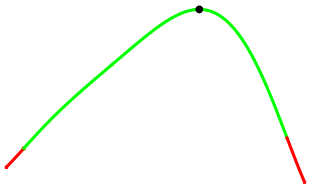
5) The function is differentiable for all points except for x=1 and x=3.

Mathematics 1 - ADE/FyCo - 2020/2021
List of exercises 02-Derivatives for identity number: 13082921

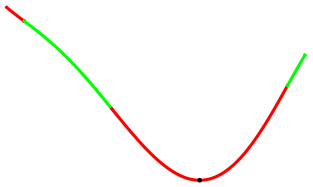
Exercise 1

Study the shape properties of $f(x)=1-60\,x^2-30\,x^3+5\,x^4+9\,x^5+2\,x^6$
to decide which amongst the following ones is the representation of the function.

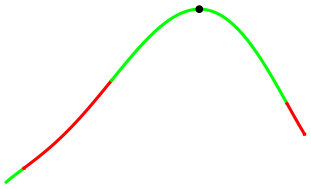
1)



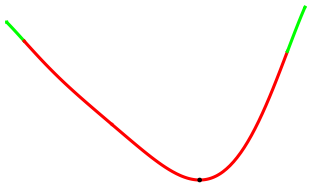
2)



3)



4)



● Big point: maximum

• Small point: minimum

Red line: convexity

Green line: concavity

Indication: To solve this exercise it is necessary to determine the concavity and convexity interval. To find the inflexion points separating the cancavity and convexity intervals, check (by means of Ruffini) with the points −2, −1, 0, 1, 2.

Exercise 2

Determine the derivative of the function $f(t)=$
$\log(\cos(t)+1)-3\sin(\cos(\cos(t)))$ and compute its value at the point t=0.

1) $f'(0)=3$ 2) $f'(0)=-2$ 3) $f'(0)=1$ 4) $f'(0)=0$

Exercise 3

Compute the limit: $\lim_{x \to 0} \frac{-1 + \cos\left[x^3\right]}{x^6}$

1) 0

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

3) ∞

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

5) $-\infty$

6) -2

7) 1

Exercise 4

Compute the limit: $\lim_{x \to 1} \frac{-3 + 7\,x - 5\,x^2 + x^3}{-3 + 2\,x + x^2}$

1) 0

2) 1

3) -2

4) ∞

5) -1

6) $-\infty$

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

Exercise 5

Between the months t=4 and t=8
, the true value of the shares of a company (in euros) are given by the function $C(t) = 243 + 144\,t - 30\,t^2 + 2\,t^3$.

Determine the interval where the value oscillates between the months t=4 and t=6.

1) It oscillates between 459 and 467.

2) It oscillates between 459 and 499.

3) It oscillates between 468 and 457.

4) It oscillates between 468 and 465.

5) It oscillates between 468 and 470.

Exercise 6

In a fish farm, data of precedings years reveal that, if the initial number of fishes is x (x in thousands), after one month they reproduce until a number of $f(x)=\frac{27\,x}{12+x}$ fishes.

What number of fishes leads to the largest increase in the number of animals, $f(x)-x$?

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

2) $\frac{19}{3}$

3) $\frac{3}{17}$

4) 6

5) $\frac{13}{9}$

Exercise 7

The yield of a tree plantation is given by $f(x)=\frac{-40+19\,x+48\,x^2}{2\,x^9}$, where x is the distance in meters between two trees.

What is the distance x that leads to the largest yield.

1) 21

2) $\frac{34}{13}$

3) 31

4) $\frac{5}{6}$

5) $\frac{9}{5}$

Exercise 8

Study the differentiability of the function $f(x)=\begin{cases} -2\,e^{x-3}-4 & x\le 3 \\ \frac{1}{2}\,((x-10)\,x+9) & 3<x<5 \\ 3\cos(5-x)-11 & 5\le x \end{cases}$

1) The function is differentiable for all points.

2) The function is not differentiable at any point.

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

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

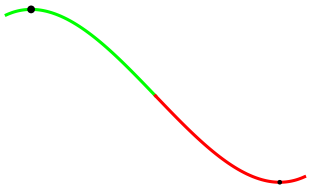
5) The function is differentiable for all points except for x=3 and x=5.

Mathematics 1 - ADE/FyCo - 2020/2021
List of exercises 02-Derivatives for identity number: 21055224

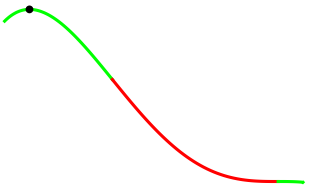
Exercise 1

Study the shape properties of the $f(x)=2+6x^2+2x^3$
to decide which amongst the following ones is the representation of the function.

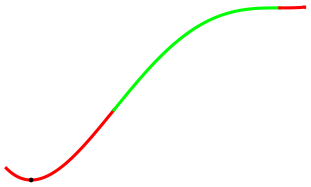
1)



2)



3)



4)

 Big point: maximum

 Small point: minimum

 Red line: convexity

 Green line: concavity

Indication: To find the maximun and minimum points of the function,
try (with Ruffini) the points -2, -1, 0, 1, 2. To solve this exercise
it is necessary to determine the increasing and decreasing intervals.

Exercise 2

Determine the derivative of the function $f(t)=$
$e^{e^{t^3}}-\cos\left(e^{t^3}\right)$ and compute its value at the point $t=0$.

1) $f'(0)=-3$ 2) $f'(0)=1$ 3) $f'(0)=2$ 4) $f'(0)=0$

Exercise 3

Compute the limit: $\lim_{x\to 0} \frac{-1 + \frac{x^2}{2} + \text{Cos}[x]}{x^4}$

1) 1

2) ∞

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

4) 0

5) $-\infty$

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

7) $\frac{1}{24}$

Exercise 4

Compute the limit: $\lim_{x\to -1} \frac{-1 - x + x^2 + x^3}{3 + 4x + x^2}$

1) ∞

2) 1

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

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

5) 0

6) $-\infty$

7) -1

Exercise 5

Between the months t=0 and t=7
, the funds in certain account (in millions of euros) are given by the function $F(t) = -15 + 42t - 24t^2 + 2t^3$.

Determine the interval where the temperature oscillates between the months t=5 and t=6.

1) It oscillates between -195 and -155.

2) It oscillates between -211 and 5.

3) It oscillates between -191 and -159.

4) It oscillates between -200 and -163.

5) It oscillates between -211 and 5.

Exercise 6

In a fish farm, data of precedings years reveal that, if the initial number of fishes is x (x in thousands), after one month they reproduce until a number of $f(x)=\frac{25\,x}{9+4\,x}$ fishes.

What number of fishes leads to the largest increase in the number of animals, $f(x)-x$?

1) $\frac{12}{7}$

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

3) $\frac{15}{19}$

4) $\frac{22}{9}$

5) $\frac{1}{8}$

Exercise 7

The yield of a tree plantation is given by $f(x)=\frac{-45+5\,x+5\,x^2}{39\,x^2}$, where x is the distance in meters between two trees.

What is the distance x that leads to the largest yield.

1) $\frac{24}{11}$

2) 18

3) 6

4) 3

5) $\frac{2}{15}$

Exercise 8

Study the differentiability of the function $f(x)=$

$$\begin{cases} -\sin(x+3)-\cos(x+3)-2 & x\le -3 \\ -x+\cos(x+3)-7 & -3<x<-1 \\ -x+3\,(x+2)\log(x+2)-7+\cos(2) & -1\le x \end{cases}$$

1) The function is differentiable for all points.

2) The function is not differentiable at any point.

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

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

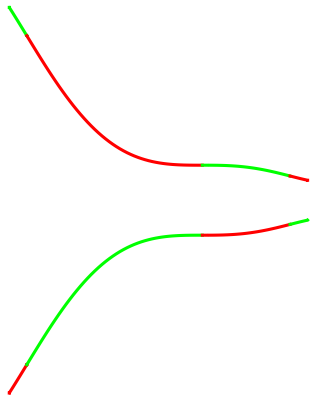
5) The function is differentiable for all points except for $x=-3$ and $x=-1$.

Mathematics 1 - ADE/FyCo - 2020/2021
List of exercises 02-Derivatives for identity number: 24265165

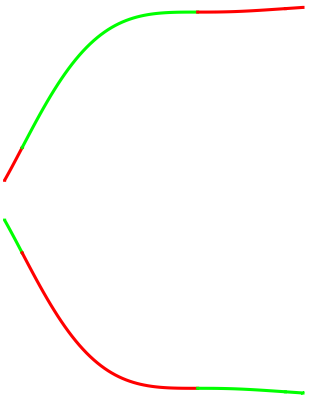
Exercise 1

Study the shape properties of $f(x)=5+20\,x^3-15\,x^4+2\,x^6$
to decide which amongst the following ones is the representation of the function.

1)



2)



3)

4)

● Big point: maximum

• Small point: minimum

Red line: convexity

Green line: concavity

Indication: To solve this exercise it is necessary to determine the concavity and convexity interval. To find the inflexion points separating the cancavity and convexity intervals, check (by means of Ruffini) with the points −2, −1, 0, 1, 2.

Exercise 2

Determine the derivative of the function $f(t)=-t^3\sin\left(\sin^3(t)\right)$ and compute its value at the point t=0.

1) $f'(0)=0$ 2) $f'(0)=3$ 3) $f'(0)=1$ 4) $f'(0)=-1$

Exercise 3

Compute the limit: $\lim_{x \to 0} \frac{-x + \text{Sin}[x]}{x^2}$

1) 1

2) $\frac{1}{3}$

3) -1

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

5) 0

6) $-\infty$

7) ∞

Exercise 4

Compute the limit: $\lim_{x \to 1} \frac{-3 + 7x - 5x^2 + x^3}{-1 + x^2}$

1) $-\frac{1}{3}$

2) -1

3) $-\infty$

4) 0

5) ∞

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

7) 1

Exercise 5

Between the months t=1 and t=8
, the true value of the shares of a company (in euros) are given by the function $C(t) = 7 + 72t - 24t^2 + 2t^3$.

Determine the interval where the value oscillates between the months t=4 and t=5.

1) It oscillates between 9 and 39.

2) It oscillates between 7 and 71.

3) It oscillates between 17 and 39.

4) It oscillates between 10 and 43.

5) It oscillates between 7 and 71.

Exercise 6

In a fish farm, data of precedings years reveal that, if the initial number of fishes is x (x in thousands), after one month they reproduce until a number of $f(x)=\frac{4x}{1+4x}$ fishes.

What number of fishes leads to the largest increase in the number of animals, $f(x)-x$?

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

2) $\frac{27}{7}$

3) 5

4) $\frac{7}{4}$

5) $\frac{37}{7}$

Exercise 7

The yield of a tree plantation is given by $f(x)=\frac{-28+x+38x^2}{3x^7}$, where x is the distance in meters between two trees.

What is the distance x that leads to the largest yield.

1) $\frac{31}{19}$

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

3) $\frac{31}{19}$

4) $\frac{17}{10}$

5) 1

Exercise 8

Study the differentiability of the function $f(x)=\begin{cases} 2e^{x-1}-1 & x\leq 1 \\ \frac{5}{2}-\frac{1}{2}(x-6)x & 1<x<4 \\ 3x-2(x-3)\log(x-3)-\frac{11}{2} & 4\leq x \end{cases}$

1) The function is differentiable for all points.

2) The function is not differentiable at any point.

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

4) The function is differentiable for all points except for x=4.

5) The function is differentiable for all points except for x=1 and x=4.

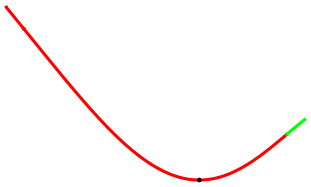
Mathematics 1 - ADE/FyCo - 2020/2021
List of exercises 02-Derivatives for identity number: 26052770

Exercise 1

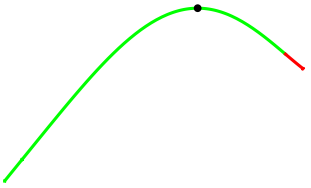
Study the shape properties of $f(x)=5-6x^2+x^3+\frac{x^4}{2}$

to decide which amongst the following ones is the representation of the function.

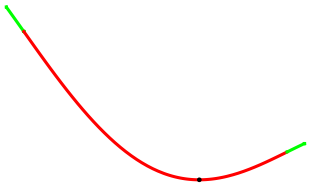
1)



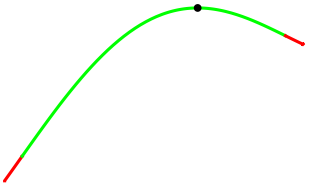
2)



3)



4)



● Big point: maximum

• Small point: minimum

Red line: convexity

Green line: concavity

Indication: To solve this exercise it is necessary to determine the concavity and convexity interval. To find the inflexion points separating the cancavity and convexity intervals, check (by means of Ruffini) with the points −2, −1, 0, 1, 2.

Exercise 2

Determine the derivative of the function $f(t)=t^3+3\log\left(\sin\left(e^t\right)+1\right)$ and compute its value at the point t=0.

1) $f'(0)=-1$ 2) $f'(0)=\frac{3\,\mathrm{Cos}[1]}{1+\mathrm{Sin}[1]}$ 3) $f'(0)=-2$ 4) $f'(0)=-3$

Exercise 3

Compute the limit: $\lim_{x\to 1} \frac{\frac{25}{4} - 12x + 9x^2 - 4x^3 + \frac{3x^4}{4} + \text{Log}\left[x^3\right]}{-1 + 5x - 10x^2 + 10x^3 - 5x^4 + x^5}$

1) 1

2) $-\infty$

3) $-\frac{1}{3}$

4) 0

5) -1

6) $\frac{3}{5}$

7) ∞

Exercise 4

Compute the limit: $\lim_{x\to 3} \frac{-9 + 15x - 7x^2 + x^3}{18 - 3x - 4x^2 + x^3}$

1) ∞

2) -1

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

4) 0

5) 1

6) $\frac{2}{5}$

7) $-\infty$

Exercise 5

Between the months t=1 and t=7
, the true value of the shares of a company (in euros) are given by the function $C(t) = 44 + 48t - 18t^2 + 2t^3$.

Determine the interval where the value oscillates between the months t=1 and t=5.

1) It oscillates between 73 and 79.

2) It oscillates between 74 and 82.

3) It oscillates between 70 and 85.

4) It oscillates between 76 and 84.

5) It oscillates between 76 and 184.

Exercise 6

In a fish farm, data of precedings years reveal that, if the initial number of fishes is x (x in thousands), after one month they reproduce until a number of $f(x)=\frac{48\,x}{3+8\,x}$ fishes.

What number of fishes leads to the largest increase in the number of animals, f(x)−x?

1) $\frac{13}{4}$

2) $\frac{5}{12}$

3) $\frac{9}{8}$

4) $\frac{18}{13}$

5) $\frac{21}{8}$

Exercise 7

The yield of a tree plantation is given by $f(x)=\frac{-47+5\,x+3\,x^2}{42\,x^6}$, where x is the distance in meters between two trees.

What is the distance x that leads to the largest yield.

1) 5

2) $\frac{47}{12}$

3) $\frac{27}{11}$

4) $\frac{36}{7}$

5) $\frac{14}{3}$

Exercise 8

Study the differentiability of the function $f(x)=\begin{cases} e^x-\cos(x)+3 & x\le 0 \\ \frac{1}{2}x\,(x+4)+6 & 0<x<1 \\ \frac{21}{2}-2\left(\sin(1-x)+\cos(1-x)\right) & 1\le x \end{cases}$

1) The function is differentiable for all points.

2) The function is not differentiable at any point.

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

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

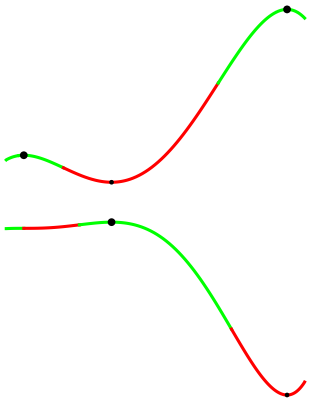
5) The function is differentiable for all points except for x=0 and x=1.

Mathematics 1 - ADE/FyCo - 2020/2021
List of exercises 02-Derivatives for identity number: 26256869

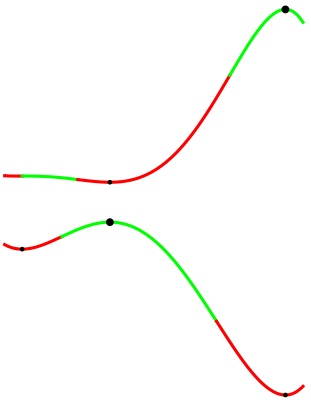
Exercise 1

Study the shape properties of the $f(x)=5-24x-6x^2+8x^3+3x^4$
to decide which amongst the following ones is the representation of the function.

1)



2)



3)

4)

● Big point: maximum

• Small point: minimum

Red line: convexity

Green line: concavity

Indication: To find the maximun and minimum points of the function,
try (with Ruffini) the points −2, −1, 0, 1, 2. To solve this exercise
it is necessary to determine the increasing and decreasing intervals.

Exercise 2

Determine the derivative of the function $f(t)=$
$e^{\sin(t)}\left(\sin\left(\sin(t)\right)+2e^{\sin(t)}\right)$ and compute its value at the point t=0.

1) $f'(0)=-1$ 2) $f'(0)=5$ 3) $f'(0)=0$ 4) $f'(0)=4$

Exercise 3

Compute the limit: $\lim_{x \to 0} \frac{-1 + e^{x^2} - x^2 - \frac{x^4}{2}}{x^5}$

1) $-\infty$

2) 0

3) -1

4) ∞

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

6) $-\frac{1}{3}$

7) 1

Exercise 4

Compute the limit: $\lim_{x \to -2} \frac{-24 - 28\,x - 6\,x^2 + 3\,x^3 + x^4}{-8 - 4\,x + 2\,x^2 + x^3}$

1) 1

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

3) ∞

4) 0

5) $-\infty$

6) -2

7) -1

Exercise 5

Between the months $t=4$ and $t=10$, the funds in certain account (in millions of euros) are given by the function $F(t) = -1 + 300\,t - 45\,t^2 + 2\,t^3$.

Determine the interval where the temperature oscillates between the months $t=6$ and $t=7$.

1) It oscillates between 499 and 624.

2) It oscillates between 588 and 613.

3) It oscillates between 499 and 624.

4) It oscillates between 589 and 614.

5) It oscillates between 580 and 611.

Exercise 6

In a fish farm, data of precedings years reveal that, if the initial number of fishes is x (x in thousands), after one month they reproduce until a number of $f(x)=\frac{49\,x}{9+46\,x}$ fishes.

What number of fishes leads to the largest increase in the number of animals, $f(x)-x$?

1) $\frac{11}{16}$

2) $\frac{6}{23}$

3) 8

4) $\frac{7}{6}$

5) $\frac{26}{17}$

Exercise 7

The yield of a tree plantation is given by $f(x)=\frac{-33+30\,x+23\,x^2}{2\,x^2}$, where x is the distance in meters between two trees.

What is the distance x that leads to the largest yield.

1) $\frac{1}{8}$

2) 8

3) $\frac{26}{17}$

4) $\frac{5}{14}$

5) $\frac{11}{5}$

Exercise 8

Study the differentiability of the function $f(x)=\begin{cases}\sin(2-x)+3\cos(2-x)+1 & x\leq 2\\ -e^2\,(x-2)+e^{x-2}+x-2\,x\sin(2)-2\cos(2-x)+5+4\sin(2) & 2<x<4\\ 2\,x-(x-3)\log(x-3)-e^2+1-4\sin(2)-2\cos(2) & 4\leq x\end{cases}$

1) The function is differentiable for all points.

2) The function is not differentiable at any point.

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

4) The function is differentiable for all points except for x=4.

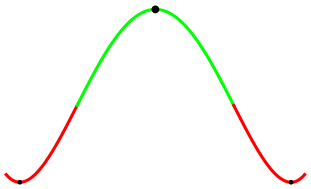
5) The function is differentiable for all points except for x=2 and x=4.

Mathematics 1 - ADE/FyCo - 2020/2021
List of exercises 02-Derivatives for identity number: 26523012

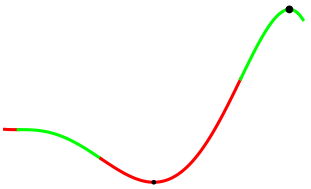
Exercise 1

Study the shape properties of the $f(x) = 4 - 240\,x^2 - 80\,x^3 + 30\,x^4 + 12\,x^5$
to decide which amongst the following ones is the representation of the function.

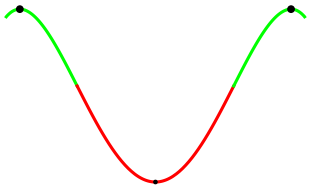
1)



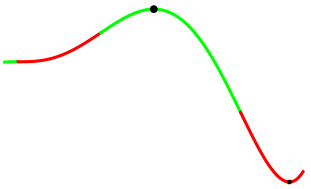
2)



3)



4)



● Big point: maximum

• Small point: minimum

Red line: convexity

Green line: concavity

Indication: To find the maximun and minimum points of the function,
try (with Ruffini) the points −2, −1, 0, 1, 2. To solve this exercise
it is necessary to determine the increasing and decreasing intervals.

Exercise 2

Determine the derivative of the function $f(t) =$
$t^2 \cos(t) + \sin(t) + \cos(t)$ and compute its value at the point t=0.

1) $f'(0) = 1$ 2) $f'(0) = -3$ 3) $f'(0) = 0$ 4) $f'(0) = 3$

Exercise 3

Compute the limit: $\lim_{x \to 0} \frac{-x^2 + \text{Sin}\left[x^2\right]}{x^4}$

1) -1

2) $-\infty$

3) ∞

4) 0

5) 1

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

7) $\frac{1}{3}$

Exercise 4

Compute the limit: $\lim_{x \to -2} \frac{2 + 3\,x + x^2}{-6 - x + x^2}$

1) $-\infty$

2) ∞

3) 1

4) -1

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

6) 0

7) -2

Exercise 5

Between the months t=1 and t=7
, the funds in certain account (in millions of euros) are given by the function $F(t) = 16 + 72\,t - 21\,t^2 + 2\,t^3$.

Determine the interval where the temperature oscillates between the months t=5 and t=7.

1) It oscillates between 69 and 177.

2) It oscillates between 111 and 169.

3) It oscillates between 107 and 167.

4) It oscillates between 96 and 97.

5) It oscillates between 101 and 177.

Exercise 6

In a fish farm, data of precedings years reveal that, if the initial number of fishes is x (x in thousands), after one month they reproduce until a number of $f(x)=\frac{16\,x}{1+20\,x}$ fishes.

What number of fishes leads to the largest increase in the number of animals, f(x)−x?

1) $\frac{3}{20}$

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

3) $\frac{19}{7}$

4) $\frac{23}{14}$

5) 1

Exercise 7

The yield of a tree plantation is given by $f(x)=\frac{-25+23\,x+14\,x^2}{28\,x^2}$, where x is the distance in meters between two trees.

What is the distance x that leads to the largest yield.

1) $\frac{50}{23}$

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

3) $\frac{19}{7}$

4) $\frac{10}{3}$

5) 2

Exercise 8

Study the differentiability of the function $f(x)=\begin{cases} -2 & x\le 2 \\ -2\left(x+\sin(2-x)\right)-3\cos(2-x)+5 & 2<x<5 \\ -\sin(5-x)-\cos(5-x)-4+2\sin(3)-3\cos(3) & 5\le x \end{cases}$

1) The function is differentiable for all points.

2) The function is not differentiable at any point.

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

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

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

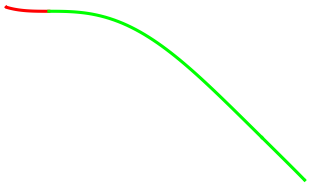
Mathematics 1 - ADE/FyCo - 2020/2021
List of exercises 02-Derivatives for identity number: 48143225

Exercise 1

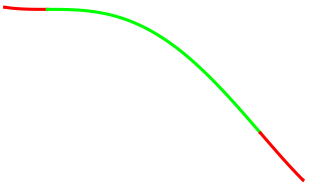
Study the shape properties of $f(x)=3+2x^3-2x^4+\frac{3x^5}{5}$

to decide which amongst the following ones is the representation of the function.

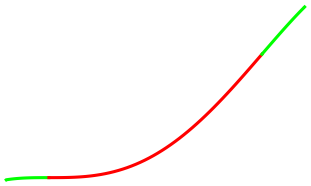
1)



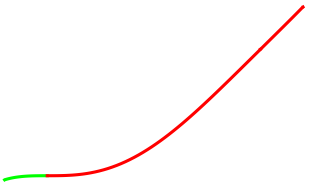
2)



3)



4)



● Big point: maximum

• Small point: minimum

Red line: convexity

Green line: concavity

Indication: To solve this exercise it is necessary to determine the concavity and convexity interval. To find the inflexion points separating the cancavity and convexity intervals, check (by means of Ruffini) with the points −2, −1, 0, 1, 2.

Exercise 2

Determine the derivative of the function $f(t)=\log(t+1)+3\sin^3(t)$ and compute its value at the point t=0.

1) $f'(0)=-2$ 2) $f'(0)=1$ 3) $f'(0)=3$ 4) $f'(0)=0$

Exercise 3

Compute the limit: $\lim_{x \to 0} \frac{-1 + e^{x^3} - x^3}{x^5}$

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

2) ∞

3) 0

4) -1

5) $-\infty$

6) 1

7) -2

Exercise 4

Compute the limit: $\lim_{x \to -3} \frac{27 + 54\,x + 36\,x^2 + 10\,x^3 + x^4}{-27 - 9\,x + 3\,x^2 + x^3}$

1) 0

2) -2

3) -1

4) ∞

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

6) 1

7) $-\infty$

Exercise 5

Between the months t=1 and t=6
, the true value of the shares of a company (in euros) are given by the function $C(t) = 33 + 12\,t - 9\,t^2 + 2\,t^3$.

Determine the interval where the value oscillates between the months t=2 and t=3.

1) It oscillates between 37 and 38.

2) It oscillates between 31 and 44.

3) It oscillates between 37 and 213.

4) It oscillates between 37 and 44.

5) It oscillates between 37 and 42.

Exercise 6

In a fish farm, data of precedings years reveal that, if the initial number of fishes is x (x in thousands), after one month they reproduce until a number of $f(x)=\frac{32\,x}{8+38\,x}$ fishes.

What number of fishes leads to the largest increase in the number of animals, $f(x)-x$?

1) $\frac{13}{2}$

2) $\frac{1}{11}$

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

4) $\frac{4}{19}$

5) $\frac{19}{3}$

Exercise 7

The yield of a tree plantation is given by $f(x)=\frac{-6+2\,x+15\,x^2}{47\,x^4}$, where x is the distance in meters between two trees.

What is the distance x that leads to the largest yield.

1) $\frac{4}{5}$

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

3) 1

4) $\frac{1}{17}$

5) $\frac{9}{17}$

Exercise 8

Study the differentiability of the function $f(x)=\begin{cases}\cos(x+2)-5 & x\le -2\\ \frac{1}{2}\,x\,(x+4)-2 & -2<x<0\\ 5\,x-3\,(x+1)\log(x+1)-2 & 0\le x\end{cases}$

1) The function is differentiable for all points.

2) The function is not differentiable at any point.

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

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

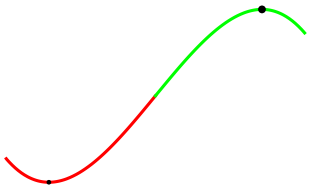
5) The function is differentiable for all points except for $x=-2$ and $x=0$.

Mathematics 1 - ADE/FyCo - 2020/2021
List of exercises 02-Derivatives for identity number: 53956072

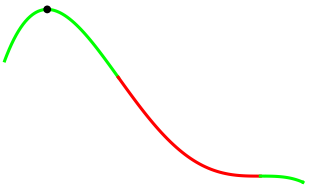
Exercise 1

Study the shape properties of the $f(x) = 1 + 24\,x + 30\,x^2 + 16\,x^3 + 3\,x^4$
to decide which amongst the following ones is the representation of the function.

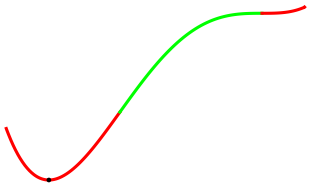
1)



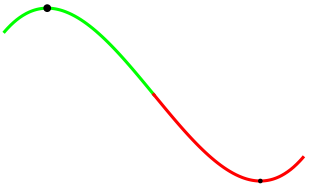
2)



3)



4)



● Big point: maximum

• Small point: minimum

Red line: convexity

Green line: concavity

Indication: To find the maximun and minimum points of the function,
try (with Ruffini) the points −2, −1, 0, 1, 2. To solve this exercise
it is necessary to determine the increasing and decreasing intervals.

Exercise 2

Determine the derivative of the function $f(t) =$
$\log(t+1) - \log(t+1)\cos^2(t)$ and compute its value at the point t=0.

1) $f'(0) = 3$ 2) $f'(0) = -2$ 3) $f'(0) = 2$ 4) $f'(0) = 0$

Exercise 3

Compute the limit: $\lim_{x \to 1} \dfrac{\frac{11}{6} - 3\,x + \frac{3\,x^2}{2} - \frac{x^3}{3} + \mathrm{Log}[x]}{1 - 4\,x + 6\,x^2 - 4\,x^3 + x^4}$

1) 0

2) −1

3) 1

4) $-\infty$

5) −2

6) $-\dfrac{1}{4}$

7) ∞

Exercise 4

Compute the limit: $\lim_{x \to -1} \frac{-1 + x^2}{3 + 4x + x^2}$

1) 1

2) ∞

3) -1

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

5) $-\infty$

6) 0

7) -2

Exercise 5

Between the months $t=0$ and $t=5$, the funds in certain account (in millions of euros) are given by the function $F(t) = 20 - 15t^2 + 2t^3$.

Determine the interval where the temperature oscillates between the months $t=3$ and $t=4$.

1) It oscillates between -89 and -60.

2) It oscillates between -102 and -60.

3) It oscillates between -105 and 20.

4) It oscillates between -92 and -61.

5) It oscillates between -105 and 20.

Exercise 6

In a fish farm, data of precedings years reveal that, if the initial number of fishes is x (x in thousands), after one month they reproduce until a number of $f(x) = \frac{45x}{5 + 30x}$ fishes.

What number of fishes leads to the largest increase in the number of animals, $f(x) - x$?

1) $\frac{2}{3}$

2) $\frac{1}{3}$

3) $\frac{1}{14}$

4) $\frac{3}{14}$

5) $\frac{7}{17}$

Exercise 7

The yield of a tree plantation is given by $f(x) = \frac{-43 + 49x + 35x^2}{31x^2}$, where x is the distance in meters between two trees.

What is the distance x that leads to the largest yield.

1) $\frac{23}{7}$

2) $\frac{86}{49}$

3) $\frac{1}{8}$

4) $\frac{29}{14}$

5) 17

Exercise 8

Study the differentiability of the function $f(x) =$

$$\begin{cases} -2\sin(x+3) - 3\cos(x+3) - 5 & x \le -3 \\ -3(x+7) + e^{x+3} + 3\cos(x+3) & -3 < x < -2 \\ -(x+3)\log(x+3) + e + 3(\cos(1) - 5) & -2 \le x \end{cases}$$

1) The function is differentiable for all points.

2) The function is not differentiable at any point.

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

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

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

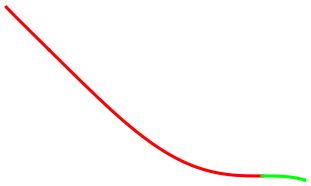
Mathematics 1 - ADE/FyCo - 2020/2021
List of exercises 02-Derivatives for identity number: 74540350

Exercise 1

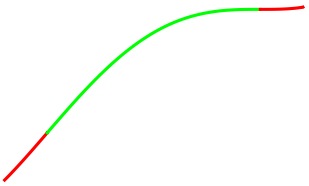
Study the shape properties of $f(x)=1+x^3+\frac{x^4}{2}$

to decide which amongst the following ones is the representation of the function.

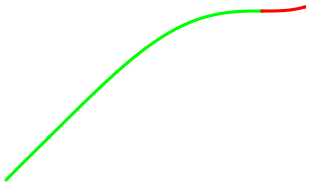
1)



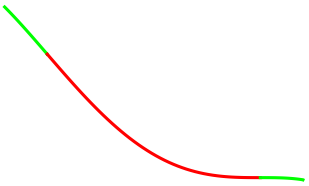
2)



3)



4)



● Big point: maximum

• Small point: minimum

Red line: convexity

Green line: concavity

Indication: To solve this exercise it is necessary to determine the concavity and convexity interval. To find the inflexion points separating the cancavity and convexity intervals, check (by means of Ruffini) with the points −2, −1, 0, 1, 2.

Exercise 2

Determine the derivative of the function $f(t)=t^3\left(t+3\sin(t)\right)\cos(t)$ and compute its value at the point t=0.

1) f'(0)=3 2) f'(0)=0 3) f'(0)=−2 4) f'(0)=4

Exercise 3

Compute the limit: $\lim_{x \to 1} \frac{\frac{11}{2} - 9x + \frac{9x^2}{2} - x^3 + \text{Log}\left[x^3\right]}{1 - 4x + 6x^2 - 4x^3 + x^4}$

1) 1

2) 0

3) ∞

4) $-\frac{1}{3}$

5) $-\infty$

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

7) -2

Exercise 4

Compute the limit: $\lim_{x \to -3} \frac{-81 - 54x + 6x^3 + x^4}{-18 - 3x + 4x^2 + x^3}$

1) -2

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

3) ∞

4) -1

5) 1

6) $-\infty$

7) 0

Exercise 5

Between the months t=4 and t=10 , the true value of the shares of a company (in euros) are given by the function $C(t) = 289 + 168t - 33t^2 + 2t^3$.

Determine the interval where the value oscillates between the months t=4 and t=7.

1) It oscillates between 543 and 569.

2) It oscillates between 534 and 669.

3) It oscillates between 529 and 567.

4) It oscillates between 524 and 552.

5) It oscillates between 534 and 561.

Exercise 6

In a fish farm, data of precedings years reveal that, if the initial number of fishes is x (x in thousands), after one month they reproduce until a number of $f(x)=\frac{25\,x}{1+16\,x}$ fishes.

What number of fishes leads to the largest increase in the number of animals, f(x)−x?

1) $\frac{31}{4}$

2) $\frac{15}{14}$

3) 4

4) $\frac{37}{17}$

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

Exercise 7

The yield of a tree plantation is given by $f(x)=\frac{-26+49\,x+45\,x^2}{19\,x^4}$, where x is the distance in meters between two trees.

What is the distance x that leads to the largest yield.

1) $\frac{39}{4}$

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

3) $\frac{17}{10}$

4) $\frac{8}{15}$

5) $\frac{9}{8}$

Exercise 8

Study the differentiability of the function $f(x)=\begin{cases} -2\,e^{x+2}+2\cos(x+2)-5 & x\le -2 \\ -3\,(x+4)+\sin(x+2)+\cos(x+2) & -2<x<-1 \\ -\sin(x+1)-\cos(x+1)-8+\sin(1)+\cos(1) & -1\le x \end{cases}$

1) The function is differentiable for all points.

2) The function is not differentiable at any point.

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

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

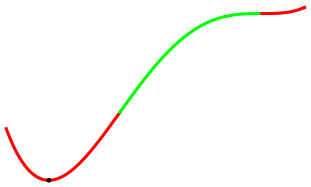
5) The function is differentiable for all points except for x=−2 and x=−1.

Mathematics 1 - ADE/FyCo - 2020/2021
List of exercises 02-Derivatives for identity number: 75573701

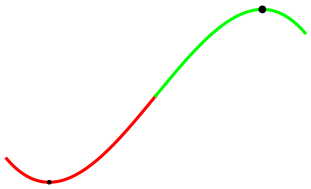
Exercise 1

Study the shape properties of the $f(x)=2+6x^2-8x^3+3x^4$
to decide which amongst the following ones is the representation of the function.

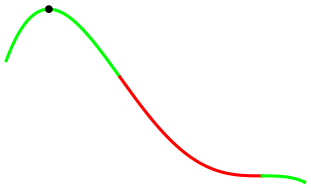
1)



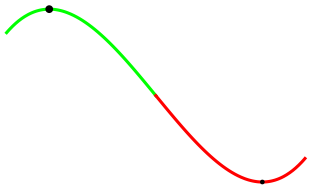
2)



3)



4)



● Big point: maximum

• Small point: minimum

—— Red line: convexity

—— Green line: concavity

Indication: To find the maximun and minimum points of the function,
try (with Ruffini) the points −2, −1, 0, 1, 2. To solve this exercise
it is necessary to determine the increasing and decreasing intervals.

Exercise 2

Determine the derivative of the function $f(t)=$
$e^t \sin(t)\left(\sin(t)-\log(t+1)\right)$ and compute its value at the point t=0.

1) $f'(0)=4$ 2) $f'(0)=2$ 3) $f'(0)=0$ 4) $f'(0)=-3$

Exercise 3

Compute the limit: $\lim_{x\to 0}\frac{-1+\frac{x^2}{2}+\text{Cos}[x]}{x^4}$

1) -2

2) $-\infty$

3) 1

4) 0

5) $\frac{1}{24}$

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

7) ∞

Exercise 4

Compute the limit: $\lim_{x\to 1}\frac{2-3x+x^3}{2-3x+x^2}$

1) $-\infty$

2) ∞

3) -1

4) 0

5) 1

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

7) -2

Exercise 5

Between the months t=4 and t=8 , the funds in certain account (in millions of euros) are given by the function $F(t)=-6+210\,t-36\,t^2+2\,t^3$.

Determine the interval where the temperature oscillates between the months t=4 and t=7.

1) It oscillates between 386 and 394.

2) It oscillates between 377 and 396.

3) It oscillates between 380 and 400.

4) It oscillates between 394 and 404.

5) It oscillates between 382 and 385.

Exercise 6

In a fish farm, data of precedings years reveal that, if the initial number of fishes is x (x in thousands), after one month they reproduce until a number of $f(x)=\frac{49\,x}{1+13\,x}$ fishes.

What number of fishes leads to the largest increase in the number of animals, f(x)−x?

1) $\frac{13}{6}$

2) $\frac{25}{16}$

3) $\frac{6}{13}$

4) $\frac{9}{5}$

5) $\frac{34}{9}$

Exercise 7

The yield of a tree plantation is given by $f(x)=\frac{-38+33\,x+4\,x^2}{7\,x^2}$, where x is the distance in meters between two trees.

What is the distance x that leads to the largest yield.

1) $\frac{17}{9}$

2) $\frac{27}{7}$

3) $\frac{2}{9}$

4) $\frac{76}{33}$

5) $\frac{25}{11}$

Exercise 8

Study the differentiability of the function $f(x)=\begin{cases} -2\sin(x)+\cos(x)-1 & x\le 0 \\ \frac{1}{4}x\,(3x-8) & 0<x<2 \\ 3x-2\,(x-1)\log(x-1)-7 & 2\le x \end{cases}$

1) The function is differentiable for all points.

2) The function is not differentiable at any point.

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

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

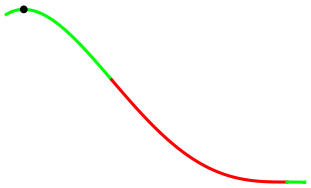
5) The function is differentiable for all points except for x=0 and x=2.

Mathematics 1 - ADE/FyCo - 2020/2021
List of exercises 02-Derivatives for identity number: 77379111

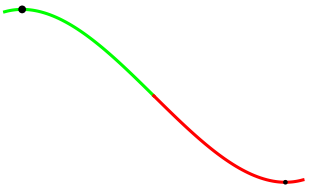
Exercise 1

Study the shape properties of the $f(x) = 2 + 48\,x - 12\,x^3 + 3\,x^4$
to decide which amongst the following ones is the representation of the function.

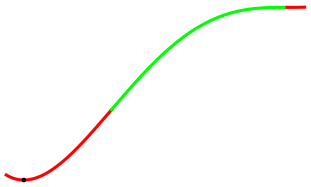
1)



2)



3)



4)

● Big point: maximum

• Small point: minimum

Red line: convexity

Green line: concavity

Indication: To find the maximun and minimum points of the function,
try (with Ruffini) the points −2, −1, 0, 1, 2. To solve this exercise
it is necessary to determine the increasing and decreasing intervals.

Exercise 2

Determine the derivative of the function $f(t) =$
$t^2\left(e^t + 2\sin(t)\right)$ and compute its value at the point t=0.

1) $f'(0) = -4$ 2) $f'(0) = 0$ 3) $f'(0) = 4$ 4) $f'(0) = 3$

Exercise 3

Compute the limit: $\lim_{x \to 0} \frac{-1 + e^x - x - \frac{x^2}{2}}{x^3}$

1) 0

2) −1

3) 1

4) $-\infty$

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

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

7) ∞

Exercise 4

Compute the limit: $\lim_{x \to 1} \frac{2 - 3x + x^3}{3 - 5x + x^2 + x^3}$

1) $-\infty$

2) −1

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

4) 0

5) −2

6) ∞

7) 1

Exercise 5

Between the months t=0 and t=7 , the funds in certain account (in millions of euros) are given by the function $F(t) = -9 - 12t^2 + 2t^3$.

Determine the interval where the temperature oscillates between the months t=1 and t=5.

1) It oscillates between −73 and −9.

2) It oscillates between −72 and −20.

3) It oscillates between −73 and −19.

4) It oscillates between −73 and 89.

5) It oscillates between −73 and −18.

Exercise 6

In a fish farm, data of precedings years reveal that, if the initial number of fishes is x (x in thousands), after one month they reproduce until a number of $f(x)=\frac{36\,x}{1+23\,x}$ fishes.

What number of fishes leads to the largest increase in the number of animals, $f(x)-x$?

1) $\frac{5}{23}$

2) $\frac{9}{17}$

3) $\frac{19}{16}$

4) $\frac{15}{2}$

5) $\frac{7}{18}$

Exercise 7

The yield of a tree plantation is given by $f(x)=\frac{-28+24\,x+42\,x^2}{6\,x^2}$, where x is the distance in meters between two trees.

What is the distance x that leads to the largest yield.

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

2) $\frac{2}{15}$

3) $\frac{34}{11}$

4) 1

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

Exercise 8

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

1) The function is differentiable for all points.

2) The function is not differentiable at any point.

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

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

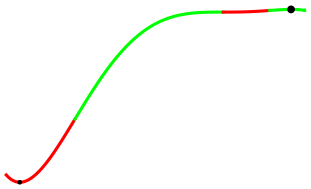
5) The function is differentiable for all points except for $x=-1$ and $x=0$.

Mathematics 1 - ADE/FyCo - 2020/2021
List of exercises 02-Derivatives for identity number: 77388334

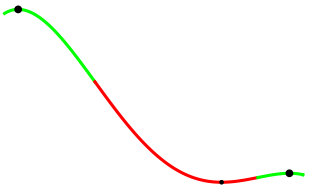
Exercise 1

Study the shape properties of the $f(x) = 5 - 240\,x + 240\,x^2 - 60\,x^3 - 30\,x^4 + 12\,x^5$
to decide which amongst the following ones is the representation of the function.

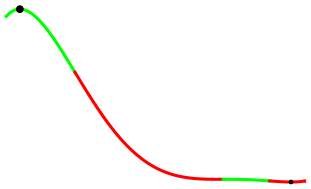
1)



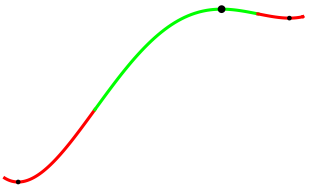
2)



3)



4)



 Big point: maximum

 Small point: minimum

 Red line: convexity

 Green line: concavity

Indication: To find the maximun and minimum points of the function,
try (with Ruffini) the points −2, −1, 0, 1, 2. To solve this exercise
it is necessary to determine the increasing and decreasing intervals.

Exercise 2

Determine the derivative of the function $f(t) =$
$\log^2(t+1) + 2\,(t+1)\,\sin(\log(t+1))$ and compute its value at the point t=0.

1) $f'(0) = -1$ 2) $f'(0) = -3$ 3) $f'(0) = 0$ 4) $f'(0) = 2$

Exercise 3

Compute the limit: $\lim_{x\to 0} \frac{-1 + e^{x^2} - x^2 - \frac{x^4}{2}}{x^5}$

1) 0

2) $-\infty$

3) -2

4) ∞

5) 1

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

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

Exercise 4

Compute the limit: $\lim_{x\to 2} \frac{24 - 44\,x + 30\,x^2 - 9\,x^3 + x^4}{4\,x - 4\,x^2 + x^3}$

1) -2

2) -1

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

4) ∞

5) 1

6) 0

7) $-\infty$

Exercise 5

Between the months t=1 and t=5 , the funds in certain account (in millions of euros) are given by the function $F(t) = 16 + 60\,t - 21\,t^2 + 2\,t^3$.

Determine the interval where the temperature oscillates between the months t=3 and t=4.

1) It oscillates between 41 and 68.

2) It oscillates between 47 and 53.

3) It oscillates between 41 and 68.

4) It oscillates between 48 and 61.

5) It oscillates between 42 and 57.

Exercise 6

In a fish farm, data of precedings years reveal that, if the initial number of fishes is x (x in thousands), after one month they reproduce until a number of $f(x)=\frac{36\,x}{25+48\,x}$ fishes.

What number of fishes leads to the largest increase in the number of animals, f(x)−x?

1) $\frac{34}{13}$

2) $\frac{7}{4}$

3) $\frac{13}{17}$

4) 3

5) $\frac{5}{48}$

Exercise 7

The yield of a tree plantation is given by $f(x)=\frac{-30+27\,x+20\,x^2}{15\,x^2}$, where x is the distance in meters between two trees.

What is the distance x that leads to the largest yield.

1) $\frac{16}{5}$

2) $\frac{20}{9}$

3) $\frac{37}{12}$

4) $\frac{37}{18}$

5) 2

Exercise 8

Study the differentiability of the function $f(x)=\begin{cases} -2\sin(3-x)-\cos(3-x)+4 & x\le 3 \\ -(x-8)\,x-12 & 3<x<4 \\ -3\,x+3\,(x-3)\log(x-3)+16 & 4\le x \end{cases}$

1) The function is differentiable for all points.

2) The function is not differentiable at any point.

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

4) The function is differentiable for all points except for x=4.

5) The function is differentiable for all points except for x=3 and x=4.

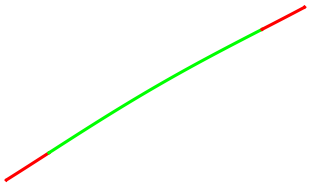
Mathematics 1 - ADE/FyCo - 2020/2021
List of exercises 02-Derivatives for identity number: 77434209

Exercise 1

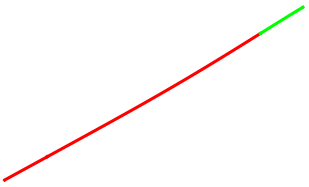
Study the shape properties of $f(x)=4-12x^2+10x^3-4x^4+\frac{3x^5}{5}$

to decide which amongst the following ones is the representation of the function.

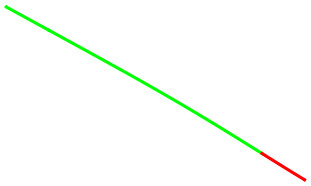
1)



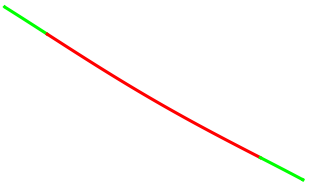
2)



3)



4)



● Big point: maximum

• Small point: minimum

Red line: convexity

Green line: concavity

Indication: To solve this exercise it is necessary to determine the concavity and convexity interval. To find the inflexion points separating the cancavity and convexity intervals, check (by means of Ruffini) with the points −2, −1, 0, 1, 2.

Exercise 2

Determine the derivative of the function $f(t)=4\sin(\cos(\log(t+1)))$ and compute its value at the point $t=0$.

1) $f'(0)=0$ 2) $f'(0)=-2$ 3) $f'(0)=-1$ 4) $f'(0)=2$

Exercise 3

Compute the limit: $\lim_{x \to 0} \frac{-x^3 + \text{Sin}\left[x^3\right]}{x^5}$

1) 1

2) $-\infty$

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

4) $\frac{2}{3}$

5) -1

6) ∞

7) 0

Exercise 4

Compute the limit: $\lim_{x \to -3} \frac{-81 - 54\,x + 6\,x^3 + x^4}{-9 + 3\,x + 5\,x^2 + x^3}$

1) -1

2) -2

3) ∞

4) 1

5) $-\infty$

6) 0

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

Exercise 5

Between the months t=3 and t=8
, the true value of the shares of a company (in euros) are given by the function $C(t) = 509 + 288\,t - 42\,t^2 + 2\,t^3$.

Determine the interval where the value oscillates between the months t=4 and t=6.

1) It oscillates between 1108 and 1154.

2) It oscillates between 1049 and 1157.

3) It oscillates between 1149 and 1157.

4) It oscillates between 1117 and 1157.

5) It oscillates between 1122 and 1164.

Exercise 6

In a fish farm, data of precedings years reveal that, if the initial number of fishes is x (x in thousands), after one month they reproduce until a number of $f(x)=\frac{8x}{2+37x}$ fishes.

What number of fishes leads to the largest increase in the number of animals, f(x)−x?

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

2) $\frac{37}{8}$

3) $\frac{31}{17}$

4) $\frac{40}{7}$

5) $\frac{2}{37}$

Exercise 7

The yield of a tree plantation is given by $f(x)=\frac{-31+42x+47x^2}{19x^4}$, where x is the distance in meters between two trees.

What is the distance x that leads to the largest yield.

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

2) $\frac{37}{8}$

3) $\frac{31}{17}$

4) $\frac{14}{17}$

5) $\frac{31}{47}$

Exercise 8

Study the differentiability of the function $f(x)=\begin{cases} -e^{x+2}-\cos(x+2)-3 & x\le -2 \\ -x-7 & -2<x<-1 \\ x-2(x+2)\log(x+2)-5 & -1\le x \end{cases}$

1) The function is differentiable for all points.

2) The function is not differentiable at any point.

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

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

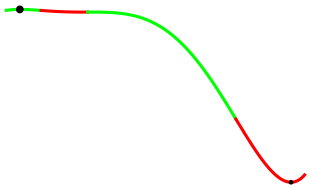
5) The function is differentiable for all points except for x=−2 and x=−1.

Mathematics 1 - ADE/FyCo - 2020/2021
List of exercises 02-Derivatives for identity number: 77435467

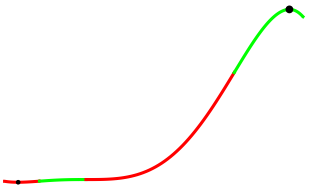
Exercise 1

Study the shape properties of the $f(x) = 2 - 240\,x - 240\,x^2 - 60\,x^3 + 30\,x^4 + 12\,x^5$ to decide which amongst the following ones is the representation of the function.

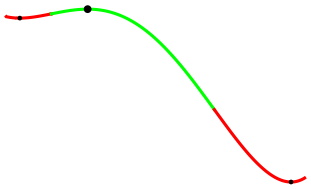
1)



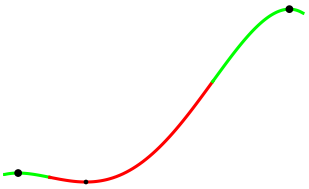
2)



3)



4)



● Big point: maximum

• Small point: minimum

Red line: convexity

Green line: concavity

Indication: To find the maximun and minimum points of the function, try (with Ruffini) the points −2, −1, 0, 1, 2. To solve this exercise it is necessary to determine the increasing and decreasing intervals.

Exercise 2

Determine the derivative of the function $f(t) = t - 2\,e^{e^t}\sin\left(e^t\right)$ and compute its value at the point t=0.

1) f'(0)=4 2) f'(0)=1 − 2 e Cos[1] − 2 e Sin[1] 3) f'(0)=−4 4) f'(0)=2

Exercise 3

Compute the limit: $\lim_{x \to 0} \frac{-1 + \cos\left[x^2\right]}{x^4}$

1) -1

2) 1

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

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

5) ∞

6) 0

7) $-\infty$

Exercise 4

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

1) $-\infty$

2) -2

3) 1

4) ∞

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

6) 0

7) -1

Exercise 5

Between the months t=3 and t=9
, the funds in certain account (in millions of euros) are given by the function $F(t) = -19 + 144\,t - 30\,t^2 + 2\,t^3$.

Determine the interval where the temperature oscillates between the months t=5 and t=7.

1) It oscillates between 197 and 205.

2) It oscillates between 189 and 201.

3) It oscillates between 205 and 195.

4) It oscillates between 197 and 305.

5) It oscillates between 207 and 200.

Exercise 6

In a fish farm, data of precedings years reveal that, if the initial number of fishes is x (x in thousands), after one month they reproduce until a number of $f(x)=\frac{50\,x}{32+3\,x}$ fishes.

What number of fishes leads to the largest increase in the number of animals, $f(x)-x$?

1) $\frac{22}{15}$

2) $\frac{6}{5}$

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

4) $\frac{2}{17}$

5) 26

Exercise 7

The yield of a tree plantation is given by $f(x)=\frac{-35+6\,x+26\,x^2}{11\,x^2}$, where x is the distance in meters between two trees.

What is the distance x that leads to the largest yield.

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

2) $\frac{15}{2}$

3) $\frac{37}{4}$

4) 17

5) $\frac{35}{3}$

Exercise 8

Study the differentiability of the function $f(x)=\begin{cases} 2\cos(2-x)+5 & x\le 2 \\ 9-2\cos(2-x) & 2<x<4 \\ 2x-3\,(x-3)\log(x-3)+1-2\cos(2) & 4\le x \end{cases}$

1) The function is differentiable for all points.

2) The function is not differentiable at any point.

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

4) The function is differentiable for all points except for x=4.

5) The function is differentiable for all points except for x=2 and x=4.

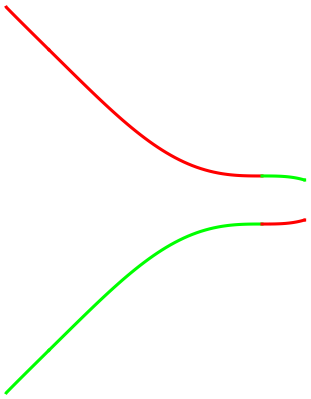
Mathematics 1 - ADE/FyCo - 2020/2021
List of exercises 02-Derivatives for identity number: 77647383

Exercise 1

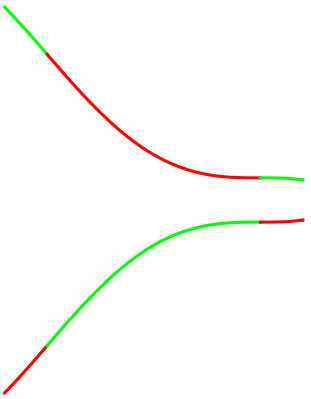
Study the shape properties of $f(x)=3+x^3+\frac{x^4}{2}$

to decide which amongst the following ones is the representation of the function.

1)



2)



3)

4)

● Big point: maximum

• Small point: minimum

—— Red line: convexity

—— Green line: concavity

Indication: To solve this exercise it is necessary to determine the concavity and convexity interval. To find the inflexion points separating the cancavity and convexity intervals, check (by means of Ruffini) with the points −2, −1, 0, 1, 2.

Exercise 2

Determine the derivative of the function $f(t)=t^4\left(3-\sin\left(t^2\right)\right)$ and compute its value at the point t=0.

1) f'(0)=0 2) f'(0)=2 3) f'(0)=1 4) f'(0)=−1

Exercise 3

Compute the limit: $\lim_{x\to 1} \frac{\frac{137}{20} - 15\,x + 15\,x^2 - 10\,x^3 + \frac{15\,x^4}{4} - \frac{3\,x^5}{5} + \text{Log}\left[x^3\right]}{1 - 6\,x + 15\,x^2 - 20\,x^3 + 15\,x^4 - 6\,x^5 + x^6}$

1) -1

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

3) $-\infty$

4) 1

5) ∞

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

7) 0

Exercise 4

Compute the limit: $\lim_{x\to -3} \frac{-27 - 9\,x + 3\,x^2 + x^3}{-18 - 3\,x + 4\,x^2 + x^3}$

1) -1

2) ∞

3) $\frac{6}{5}$

4) $-\infty$

5) -2

6) 1

7) 0

Exercise 5

Between the months t=4 and t=10
, the true value of the shares of a company (in euros) are given by the function $C(t) = 403 + 210\,t - 36\,t^2 + 2\,t^3$.

Determine the interval where the value oscillates between the months t=4 and t=9.

1) It oscillates between 799 and 833.

2) It oscillates between 795 and 903.

3) It oscillates between 795 and 803.

4) It oscillates between 795 and 835.

5) It oscillates between 803 and 828.

Exercise 6

In a fish farm, data of precedings years reveal that, if the initial number of fishes is x (x in thousands), after one month they reproduce until a number of $f(x)=\frac{49\,x}{16+13\,x}$ fishes.

What number of fishes leads to the largest increase in the number of animals, $f(x)-x$?

1) $\frac{9}{20}$

2) $\frac{37}{20}$

3) $\frac{5}{9}$

4) $\frac{12}{13}$

5) $\frac{11}{6}$

Exercise 7

The yield of a tree plantation is given by $f(x)=\frac{-5+34\,x+22\,x^2}{50\,x^4}$, where x is the distance in meters between two trees.

What is the distance x that leads to the largest yield.

1) $\frac{2}{11}$

2) $\frac{10}{19}$

3) 36

4) $\frac{6}{7}$

5) 19

Exercise 8

Study the differentiability of the function $f(x)=\begin{cases} -e^{x+2}+2\cos(x+2)-3 & x\le -2 \\ \frac{3x^2}{4}+2x-1 & -2<x<0 \\ x-(x+1)\log(x+1)-1 & 0\le x \end{cases}$

1) The function is differentiable for all points.

2) The function is not differentiable at any point.

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

4) The function is differentiable for all points except for x=0.

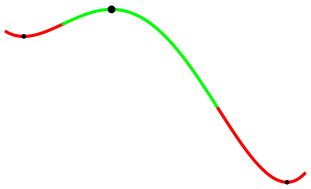
5) The function is differentiable for all points except for x=−2 and x=0.

Mathematics 1 - ADE/FyCo - 2020/2021
List of exercises 02-Derivatives for identity number: 77648906

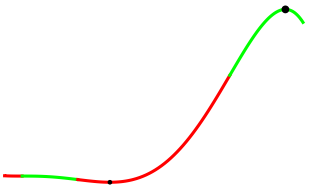
Exercise 1

Study the shape properties of the $f(x)=5-60\,x^2-60\,x^3+12\,x^5$
to decide which amongst the following ones is the representation of the function.

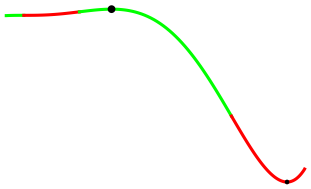
1)



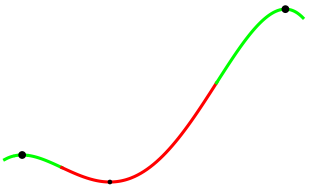
2)



3)



4)



● Big point: maximum

• Small point: minimum

Red line: convexity

Green line: concavity

Indication: To find the maximun and minimum points of the function,
try (with Ruffini) the points −2, −1, 0, 1, 2. To solve this exercise
it is necessary to determine the increasing and decreasing intervals.

Exercise 2

Determine the derivative of the function $f(t)=$
$-2\log^2(t+1)$ and compute its value at the point t=0.

1) $f'(0)=2$ 2) $f'(0)=-2$ 3) $f'(0)=-3$ 4) $f'(0)=0$

Exercise 3

Compute the limit: $\lim_{x\to 0}\frac{-x^2+\text{Sin}\left[x^2\right]}{x^4}$

1) 1

2) $-\infty$

3) -1

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

5) ∞

6) 0

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

Exercise 4

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

1) 0

2) -1

3) $-\infty$

4) ∞

5) -2

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

7) 1

Exercise 5

Between the months t=3 and t=7 , the funds in certain account (in millions of euros) are given by the function $F(t)=-9+72t-21t^2+2t^3$.

Determine the interval where the temperature oscillates between the months t=5 and t=6.

1) It oscillates between 71 and 152.

2) It oscillates between 77 and 95.

3) It oscillates between 71 and 72.

4) It oscillates between 76 and 99.

5) It oscillates between 69 and 97.

Exercise 6

In a fish farm, data of precedings years reveal that, if the initial number of fishes is x (x in thousands), after one month they reproduce until a number of $f(x)=\frac{36\,x}{1+15\,x}$ fishes.

What number of fishes leads to the largest increase in the number of animals, $f(x)-x$?

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

2) $\frac{1}{3}$

3) $\frac{40}{13}$

4) 5

5) 3

Exercise 7

The yield of a tree plantation is given by $f(x)=\frac{-42+26\,x+10\,x^2}{11\,x^2}$, where x is the distance in meters between two trees.

What is the distance x that leads to the largest yield.

1) $\frac{19}{15}$

2) $\frac{18}{5}$

3) $\frac{30}{17}$

4) $\frac{42}{13}$

5) $\frac{17}{13}$

Exercise 8

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

1) The function is differentiable for all points.

2) The function is not differentiable at any point.

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

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

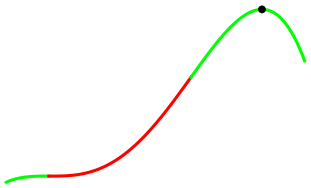
5) The function is differentiable for all points except for x=0 and x=1.

Mathematics 1 - ADE/FyCo - 2020/2021
List of exercises 02-Derivatives for identity number: 77770524

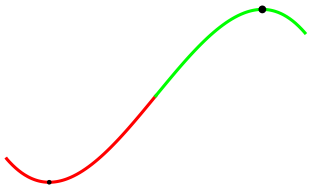
Exercise 1

Study the shape properties of the $f(x)=5-24x+30x^2-16x^3+3x^4$
to decide which amongst the following ones is the representation of the function.

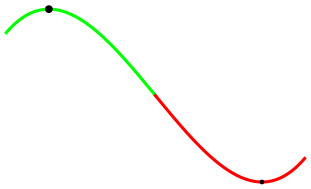
1)



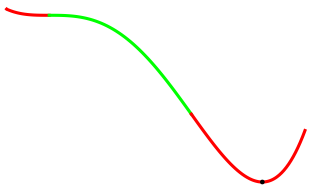
2)



3)



4)



● Big point: maximum

• Small point: minimum

Red line: convexity

Green line: concavity

Indication: To find the maximun and minimum points of the function,
try (with Ruffini) the points −2, −1, 0, 1, 2. To solve this exercise
it is necessary to determine the increasing and decreasing intervals.

Exercise 2

Determine the derivative of the function $f(t)=$
$3e^t\sin(t)+3$ and compute its value at the point $t=0$.

1) $f'(0)=-4$ 2) $f'(0)=1$ 3) $f'(0)=-2$ 4) $f'(0)=3$

Exercise 3

Compute the limit: $\lim_{x \to 0} \frac{-1 + e^x - x - \frac{x^2}{2} - \frac{x^3}{6}}{x^4}$

1) $-\infty$

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

3) ∞

4) 1

5) -2

6) $\frac{1}{24}$

7) 0

Exercise 4

Compute the limit: $\lim_{x \to 1} \frac{2 - 7x + 9x^2 - 5x^3 + x^4}{2 - 3x + x^3}$

1) -2

2) 0

3) 1

4) ∞

5) -1

6) $-\infty$

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

Exercise 5

Between the months $t=1$ and $t=7$, the funds in certain account (in millions of euros) are given by the function $F(t) = 8 + 126t - 30t^2 + 2t^3$.

Determine the interval where the temperature oscillates between the months $t=6$ and $t=7$.

1) It oscillates between 106 and 170.

2) It oscillates between 106 and 170.

3) It oscillates between 106 and 116.

4) It oscillates between 108 and 114.

5) It oscillates between 108 and 106.

Exercise 6

In a fish farm, data of precedings years reveal that, if the initial number of fishes is x (x in thousands), after one month they reproduce until a number of $f(x)=\frac{25\,x}{1+49\,x}$ fishes.

What number of fishes leads to the largest increase in the number of animals, $f(x)-x$?

1) $\frac{29}{16}$

2) 1

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

4) $\frac{4}{49}$

5) $\frac{3}{2}$

Exercise 7

The yield of a tree plantation is given by $f(x)=\frac{-6+8\,x+21\,x^2}{43\,x^2}$, where x is the distance in meters between two trees.

What is the distance x that leads to the largest yield.

1) 2

2) $\frac{20}{13}$

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

4) $\frac{20}{3}$

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

Exercise 8

Study the differentiability of the function $f(x)=$

$$\begin{cases} \sin(x+1)-4 & x\le -1 \\ x+2\,e^{x+1}-2\,e^3\,(x+1)-2\,x\sin(3)-2\cos(x+1)-1-2\sin(3) & -1<x<2 \\ -\sin(2-x)-\cos(2-x)-2\left(-1+2\,e^3+3\sin(3)+\cos(3)\right) & 2\le x \end{cases}$$

1) The function is differentiable for all points.

2) The function is not differentiable at any point.

3) The function is differentiable for all points except for x=−1.

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

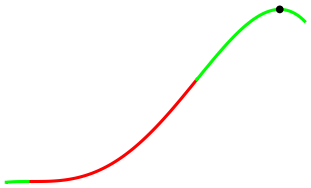
5) The function is differentiable for all points except for x=−1 and x=2.

Mathematics 1 - ADE/FyCo - 2020/2021
List of exercises 02-Derivatives for identity number: 78026316

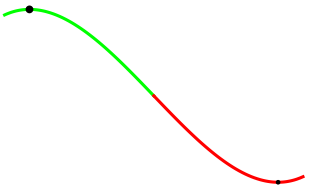
Exercise 1

Study the shape properties of the $f(x)=3+6x^2+2x^3$
to decide which amongst the following ones is the representation of the function.

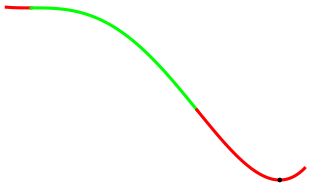
1)



2)



3)



4)

● Big point: maximum

• Small point: minimum

Red line: convexity

Green line: concavity

Indication: To find the maximun and minimum points of the function,
try (with Ruffini) the points −2, −1, 0, 1, 2. To solve this exercise
it is necessary to determine the increasing and decreasing intervals.

Exercise 2

Determine the derivative of the function $f(t)=$
$2\cos(\log(t+1))+3$ and compute its value at the point t=0.

1) $f'(0)=-3$ 2) $f'(0)=-4$ 3) $f'(0)=4$ 4) $f'(0)=0$

Exercise 3

Compute the limit: $\lim_{x\to 1}\frac{1-x+\text{Log}[x]}{1-2x+x^2}$

1) 1

2) 0

3) −2

4) ∞

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

6) $-\infty$

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

Exercise 4

Compute the limit: $\lim_{x \to -1} \frac{-3 - 5x - x^2 + x^3}{3 + 7x + 5x^2 + x^3}$

1) ∞

2) -2

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

4) -1

5) 0

6) $-\infty$

7) 1

Exercise 5

Between the months $t=0$ and $t=7$, the funds in certain account (in millions of euros) are given by the function $F(t) = -3 + 48t - 18t^2 + 2t^3$.

Determine the interval where the temperature oscillates between the months $t=1$ and $t=3$.

1) It oscillates between 22 and 41.

2) It oscillates between 29 and 37.

3) It oscillates between 24 and 41.

4) It oscillates between -3 and 137.

5) It oscillates between 36 and 33.

Exercise 6

In a fish farm, data of precedings years reveal that, if the initial number of fishes is x (x in thousands), after one month they reproduce until a number of $f(x) = \frac{45x}{20 + 41x}$ fishes.

What number of fishes leads to the largest increase in the number of animals, $f(x) - x$?

1) $\frac{30}{13}$

2) $\frac{10}{41}$

3) $\frac{6}{19}$

4) $\frac{33}{20}$

5) $\frac{1}{10}$

Exercise 7

The yield of a tree plantation is given by $f(x) = \frac{-13 + 16x + 24x^2}{44x^2}$, where x is the distance in meters between two trees.

What is the distance x that leads to the largest yield.

1) $\frac{12}{5}$

2) 20

3) $\frac{13}{8}$

4) $\frac{7}{6}$

5) $\frac{2}{19}$

Exercise 8

Study the differentiability of the function $f(x) = \begin{cases} -\sin(x+3) - 3\cos(x+3) + 4 & x \le -3 \\ \frac{1}{3}\left(x^2 - 6\right) & -3 < x < 0 \\ 2(\cos(x) - 2) & 0 \le x \end{cases}$

1) The function is differentiable for all points.

2) The function is not differentiable at any point.

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

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

5) The function is differentiable for all points except for $x=-3$ and $x=0$.

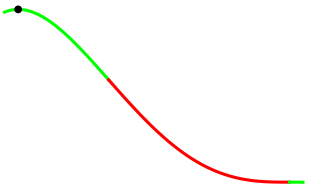
Mathematics 1 - ADE/FyCo - 2020/2021
List of exercises 02-Derivatives for identity number: 78428692

Exercise 1

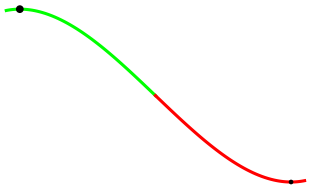
Study the shape properties of the $f(x)=4-24x+2x^3$
to decide which amongst the following ones is the representation of the function.

1)

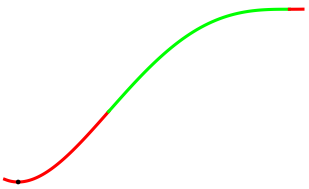
2)



3)



4)



● Big point: maximum

• Small point: minimum

Red line: convexity

Green line: concavity

Indication: To find the maximun and minimum points of the function,
try (with Ruffini) the points −2, −1, 0, 1, 2. To solve this exercise
it is necessary to determine the increasing and decreasing intervals.

Exercise 2

Determine the derivative of the function $f(t)=$
$t\left(e^t-e^{\cos(t)}\right)$ and compute its value at the point t=0.

1) $f'(0)=1-e$ 2) $f'(0)=-2$ 3) $f'(0)=4$ 4) $f'(0)=3$

Exercise 3

Compute the limit: $\lim_{x\to 0}\dfrac{-1+e^x-x-\frac{x^2}{2}-\frac{x^3}{6}}{x^4}$

1) -1

2) -2

3) 1

4) $\dfrac{1}{24}$

5) ∞

6) $-\infty$

7) 0

Exercise 4

Compute the limit: $\lim_{x \to 1} \frac{3 - 5\,x + x^2 + x^3}{-1 + x^2}$

1) ∞

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

3) -1

4) 1

5) -2

6) 0

7) $-\infty$

Exercise 5

Between the months $t=2$ and $t=9$, the funds in certain account (in millions of euros) are given by the function $F(t) = 4 + 108\,t - 33\,t^2 + 2\,t^3$.

Determine the interval where the temperature oscillates between the months $t=2$ and $t=5$.

1) It oscillates between -21 and 103.

2) It oscillates between -239 and 104.

3) It oscillates between -35 and 104.

4) It oscillates between -31 and 104.

5) It oscillates between -239 and 104.

Exercise 6

In a fish farm, data of precedings years reveal that, if the initial number of fishes is x (x in thousands), after one month they reproduce until a number of $f(x) = \frac{40\,x}{10 + 19\,x}$ fishes.

What number of fishes leads to the largest increase in the number of animals, $f(x) - x$?

1) 5

2) $\frac{14}{17}$

3) $\frac{11}{4}$

4) $\frac{10}{19}$

5) 2

Exercise 7

The yield of a tree plantation is given by $f(x) = \frac{-39 + 37x + 44x^2}{42x^2}$, where x is the distance in meters between two trees.

What is the distance x that leads to the largest yield.

1) $\frac{14}{13}$

2) $\frac{13}{2}$

3) $\frac{34}{3}$

4) $\frac{22}{17}$

5) $\frac{78}{37}$

Exercise 8

Study the differentiability of the function $f(x) = \begin{cases} 2\sin(x+1) + 3\cos(x+1) + 3 & x \le -1 \\ \frac{47}{6} - \frac{1}{6}(x-10)x & -1 < x < 2 \\ e^{x-2} + \frac{19}{2} & 2 \le x \end{cases}$

1) The function is differentiable for all points.

2) The function is not differentiable at any point.

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

4) The function is differentiable for all points except for $x=2$.

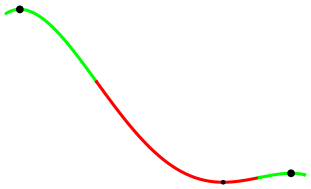
5) The function is differentiable for all points except for $x=-1$ and $x=2$.

Mathematics 1 - ADE/FyCo - 2020/2021
List of exercises 02-Derivatives for identity number: 753486173

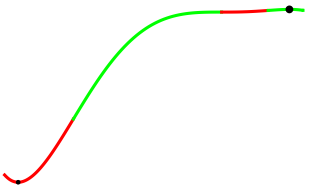
Exercise 1

Study the shape properties of the $f(x) = 5 - 240\,x + 240\,x^2 - 60\,x^3 - 30\,x^4 + 12\,x^5$
to decide which amongst the following ones is the representation of the function.

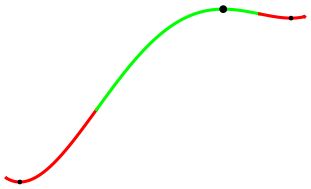
1)



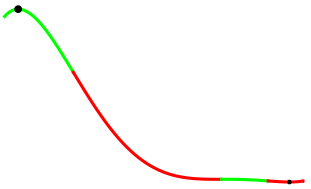
2)



3)



4)



 Big point: maximum

 Small point: minimum

 Red line: convexity

 Green line: concavity

Indication: To find the maximun and minimum points of the function,
try (with Ruffini) the points −2, −1, 0, 1, 2. To solve this exercise
it is necessary to determine the increasing and decreasing intervals.

Exercise 2

Determine the derivative of the function $f(t) =$
$2\sin(\log(t+1))\cos\left(\sin(\log(t+1))\right)$ and compute its value at the point t=0.

1) $f'(0) = 4$ 2) $f'(0) = 3$ 3) $f'(0) = -1$ 4) $f'(0) = 2$

Exercise 3

Compute the limit: $\lim_{x\to 1}\frac{\frac{25}{6}-8x+6x^2-\frac{8x^3}{3}+\frac{x^4}{2}+\text{Log}\left[x^2\right]}{-1+5x-10x^2+10x^3-5x^4+x^5}$

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

2) $-\infty$

3) 0

4) -1

5) 1

6) $\frac{2}{5}$

7) ∞

Exercise 4

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

1) $-\infty$

2) -2

3) 1

4) 0

5) ∞

6) -1

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

Exercise 5

Between the months t=2 and t=6
, the funds in certain account (in millions of euros) are given by the function $F(t)=-2+72t-21t^2+2t^3$.

Determine the interval where the temperature oscillates between the months t=5 and t=6.

1) It oscillates between 87 and 104.

2) It oscillates between 74 and 106.

3) It oscillates between 79 and 100.

4) It oscillates between 83 and 106.

5) It oscillates between 78 and 79.

Exercise 6

In a fish farm, data of precedings years reveal that, if the initial number of fishes is x (x in thousands), after one month they reproduce until a number of $f(x)=\frac{24\,x}{6+49\,x}$ fishes.

What number of fishes leads to the largest increase in the number of animals, $f(x)-x$?

1) $\frac{19}{6}$

2) $\frac{6}{49}$

3) $\frac{13}{19}$

4) $\frac{25}{17}$

5) 11

Exercise 7

The yield of a tree plantation is given by $f(x)=\frac{-32+33\,x+28\,x^2}{19\,x^2}$, where x is the distance in meters between two trees.

What is the distance x that leads to the largest yield.

1) $\frac{13}{3}$

2) $\frac{64}{33}$

3) $\frac{17}{2}$

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

5) $\frac{37}{11}$

Exercise 8

Study the differentiability of the function $f(x)=\begin{cases} -2\sin(1-x)+\cos(1-x)+3 & x\le 1 \\ 2\,(x+\cos(1-x))+1 & 1<x<3 \\ x+(x-2)\log(x-2)+4+2\cos(2) & 3\le x \end{cases}$

1) The function is differentiable for all points.

2) The function is not differentiable at any point.

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

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

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

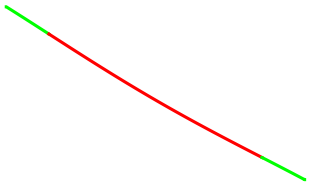
Mathematics 1 - ADE/FyCo - 2020/2021
List of exercises 02-Derivatives for identity number: 10618500094

Exercise 1

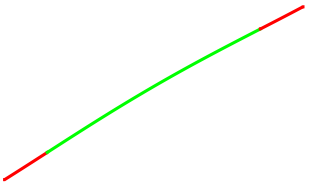
Study the shape properties of $f(x) = 4 - 24\,x^2 + 16\,x^3 - 5\,x^4 + \frac{3\,x^5}{5}$

to decide which amongst the following ones is the representation of the function.

1)

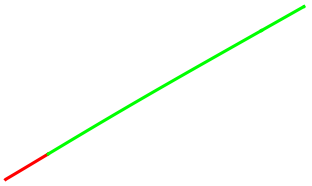


2)



3)

4)



● Big point: maximum

• Small point: minimum

Red line: convexity

Green line: concavity

Indication: To solve this exercise it is necessary to determine the concavity and convexity interval. To find the inflexion points separating the cancavity and convexity intervals, check (by means of Ruffini) with the points −2, −1, 0, 1, 2.

Exercise 2

Determine the derivative of the function $f(t) = 3\,e^{2\,t^3} + 3$ and compute its value at the point t=0.

1) f'(0)=−2 2) f'(0)=1 3) f'(0)=−3 4) f'(0)=0

Exercise 3

Compute the limit: $\lim_{x \to 1} \frac{\frac{25}{4} - 12\,x + 9\,x^2 - 4\,x^3 + \frac{3\,x^4}{4} + \text{Log}\left[x^3\right]}{-1 + 5\,x - 10\,x^2 + 10\,x^3 - 5\,x^4 + x^5}$

1) 1

2) −2

3) $-\infty$

4) ∞

5) 0

6) −1

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

Exercise 4

Compute the limit: $\lim_{x \to 3} \frac{9\,x - 6\,x^2 + x^3}{18 - 3\,x - 4\,x^2 + x^3}$

1) $-\infty$

2) $\frac{3}{5}$

3) −1

4) 1

5) 0

6) ∞

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

Exercise 5

Between the months t=1 and t=8
, the true value of the shares of a company (in euros) are given by the function $C(t) = 72 + 48\,t - 18\,t^2 + 2\,t^3$.

Determine the interval where the value oscillates between the months t=3 and t=5.

1) It oscillates between 99 and 120.

2) It oscillates between 108 and 116.

3) It oscillates between 104 and 328.

4) It oscillates between 110 and 115.

5) It oscillates between 104 and 112.

Exercise 6

In a fish farm, data of precedings years reveal that, if the initial number of fishes is x (x in thousands), after one month they reproduce until a number of $f(x)=\frac{32\,x}{2+31\,x}$ fishes.

What number of fishes leads to the largest increase in the number of animals, $f(x)-x$?

1) $\frac{8}{7}$

2) $\frac{22}{15}$

3) $\frac{13}{7}$

4) $\frac{26}{11}$

5) $\frac{6}{31}$

Exercise 7

The yield of a tree plantation is given by $f(x)=\frac{-25+5\,x+3\,x^2}{25\,x^5}$, where x is the distance in meters between two trees.

What is the distance x that leads to the largest yield.

1) $\frac{4}{5}$

2) $\frac{11}{8}$

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

4) $\frac{25}{9}$

5) $\frac{19}{9}$

Exercise 8

Study the differentiability of the function $f(x)=\begin{cases} 2\left(e^{x+1}+1\right) & x\le -1 \\ -2\,(x+2)\,(\log(x+2)-2) & -1<x<2 \\ \cos(2-x)+15-8\log(4) & 2\le x \end{cases}$

1) The function is differentiable for all points.

2) The function is not differentiable at any point.

3) The function is differentiable for all points except for x=−1.

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

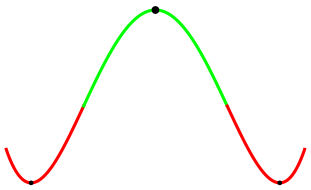
5) The function is differentiable for all points except for x=−1 and x=2.

Mathematics 1 - ADE/FyCo - 2020/2021
List of exercises 02-Derivatives for identity number: 10901600079

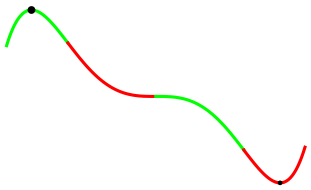
Exercise 1

Study the shape properties of the $f(x)=5+60\,x^2+100\,x^3+60\,x^4+12\,x^5$
to decide which amongst the following ones is the representation of the function.

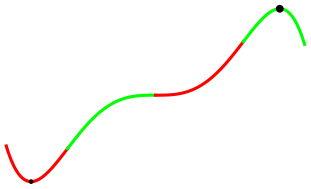
1)



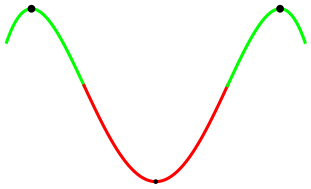
2)



3)



4)



● Big point: maximum

• Small point: minimum

Red line: convexity

Green line: concavity

Indication: To find the maximun and minimum points of the function,
try (with Ruffini) the points −2, −1, 0, 1, 2. To solve this exercise
it is necessary to determine the increasing and decreasing intervals.

Exercise 2

Determine the derivative of the function $f(t)=$
$2\sin(t)\left(\sin(t)-2\cos(t)\right)$ and compute its value at the point t=0.

1) $f'(0)=4$ 2) $f'(0)=0$ 3) $f'(0)=-4$ 4) $f'(0)=2$

Exercise 3

Compute the limit: $\lim_{x \to 0} \frac{-x^2 + \text{Sin}\left[x^2\right]}{x^3}$

1) -1

2) $-\infty$

3) 0

4) $-\frac{1}{3}$

5) ∞

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

7) 1

Exercise 4

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

1) ∞

2) $-\infty$

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

4) -1

5) 0

6) 1

7) -2

Exercise 5

Between the months $t=0$ and $t=4$, the funds in certain account (in millions of euros) are given by the function $F(t) = -5 + 24t - 15t^2 + 2t^3$.

Determine the interval where the temperature oscillates between the months $t=1$ and $t=2$.

1) It oscillates between -21 and 6.

2) It oscillates between -1 and 6.

3) It oscillates between -10 and 16.

4) It oscillates between -21 and 6.

5) It oscillates between 2 and 4.

Exercise 6

In a fish farm, data of precedings years reveal that, if the initial number of fishes is x (x in thousands), after one month they reproduce until a number of $f(x)=\frac{18\,x}{2+41\,x}$ fishes.

What number of fishes leads to the largest increase in the number of animals, $f(x)-x$?

1) $\frac{17}{6}$

2) 9

3) 9

4) $\frac{9}{5}$

5) $\frac{4}{41}$

Exercise 7

The yield of a tree plantation is given by $f(x)=\frac{-34+17\,x+8\,x^2}{34\,x^2}$, where x is the distance in meters between two trees.

What is the distance x that leads to the largest yield.

1) $\frac{3}{20}$

2) $\frac{7}{8}$

3) $\frac{11}{4}$

4) $\frac{23}{4}$

5) 4

Exercise 8

Study the differentiability of the function $f(x)=$

$$\begin{cases} 2\sin(1-x)+\cos(1-x)+3 & x\le 1 \\ x-3\,x\log(x)+3 & 1<x<4 \\ \cos(4-x)+2\left(\sin(4-x)+4-6\log(4)\right) & 4\le x \end{cases}$$

1) The function is differentiable for all points.

2) The function is not differentiable at any point.

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

4) The function is differentiable for all points except for x=4.

5) The function is differentiable for all points except for x=1 and x=4.

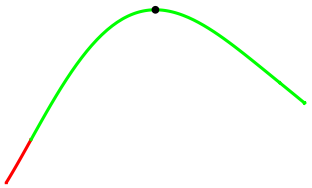
Mathematics 1 - ADE/FyCo - 2020/2021
List of exercises 02-Derivatives for identity number: 11116551121

Exercise 1

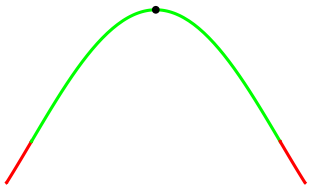
Study the shape properties of $f(x)=5+6x^2-2x^3-x^4+\frac{3x^5}{5}$

to decide which amongst the following ones is the representation of the function.

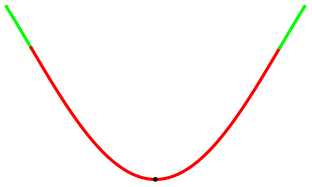
1)



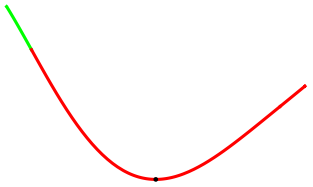
2)



3)



4)



● Big point: maximum

• Small point: minimum

Red line: convexity

Green line: concavity

Indication: To solve this exercise it is necessary to determine the concavity and convexity interval. To find the inflexion points separating the cancavity and convexity intervals, check (by means of Ruffini) with the points −2, −1, 0, 1, 2.

Exercise 2

Determine the derivative of the function $f(t)=3\,e^{e^t+\cos(e^t)}$ and compute its value at the point t=0.

1) $f'(0)=3\,e^{1+\cos[1]}\left(1-\sin[1]\right)$ 2) $f'(0)=-3$ 3) $f'(0)=4$ 4) $f'(0)=2$

Exercise 3

Compute the limit: $\lim_{x\to 0}\frac{-1+e^{x^3}-x^3}{x^5}$

1) 0

2) -1

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

4) $-\infty$

5) ∞

6) 1

7) $-\frac{1}{3}$

Exercise 4

Compute the limit: $\lim_{x\to 3}\frac{-81+54\,x-6\,x^3+x^4}{9+3\,x-5\,x^2+x^3}$

1) $-\infty$

2) 0

3) ∞

4) 1

5) -1

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

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

Exercise 5

Between the months t=2 and t=6
, the true value of the shares of a company (in euros) are given by the function $C(t)=100+90\,t-24\,t^2+2\,t^3$.

Determine the interval where the value oscillates between the months t=3 and t=6.

1) It oscillates between 190 and 211.

2) It oscillates between 199 and 198.

3) It oscillates between 207 and 205.

4) It oscillates between 200 and 208.

5) It oscillates between 196 and 204.

Exercise 6

In a fish farm, data of precedings years reveal that, if the initial number of fishes is x (x in thousands), after one month they reproduce until a number of $f(x)=\frac{24\,x}{6+10\,x}$ fishes.

What number of fishes leads to the largest increase in the number of animals, $f(x)-x$?

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

2) 1

3) $\frac{7}{13}$

4) $\frac{6}{5}$

5) $\frac{19}{12}$

Exercise 7

The yield of a tree plantation is given by $f(x)=\frac{-2+20\,x+30\,x^2}{15\,x^5}$, where x is the distance in meters between two trees.

What is the distance x that leads to the largest yield.

1) $\frac{23}{7}$

2) $\frac{1}{9}$

3) $\frac{17}{4}$

4) $\frac{9}{8}$

5) $\frac{19}{12}$

Exercise 8

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

1) The function is differentiable for all points.

2) The function is not differentiable at any point.

3) The function is differentiable for all points except for x=−1.

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

5) The function is differentiable for all points except for x=−1 and x=1.

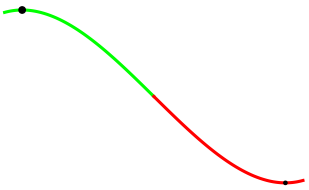
Mathematics 1 - ADE/FyCo - 2020/2021
List of exercises 02-Derivatives for identity number: 20531650581

Exercise 1

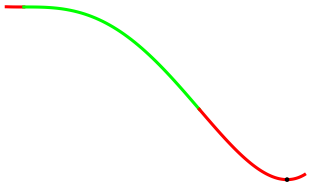
Study the shape properties of the $f(x) = 2 - 48x + 12x^3 + 3x^4$
to decide which amongst the following ones is the representation of the function.

1)

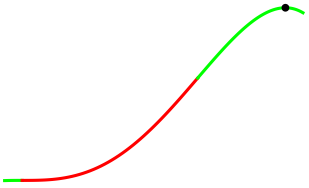
2)



3)



4)



● Big point: maximum

• Small point: minimum

Red line: convexity

Green line: concavity

Indication: To find the maximun and minimum points of the function,
try (with Ruffini) the points −2, −1, 0, 1, 2. To solve this exercise
it is necessary to determine the increasing and decreasing intervals.

Exercise 2

Determine the derivative of the function $f(t) = \sin\left(e^{\sin(t)}\right) \sin\left(\sin(t)\right)$ and compute its value at the point t=0.

1) f'(0)=2 2) f'(0)=4 3) f'(0)=Sin[1] 4) f'(0)=−1

Exercise 3

Compute the limit: $\lim_{x \to 1} \frac{\frac{3}{2} - 2x + \frac{x^2}{2} + \text{Log}[x]}{-1 + 3x - 3x^2 + x^3}$

1) -2

2) $\frac{1}{3}$

3) 1

4) $-\infty$

5) 0

6) ∞

7) -1

Exercise 4

Compute the limit: $\lim_{x \to -1} \frac{x + 3x^2 + 3x^3 + x^4}{-1 - x + x^2 + x^3}$

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

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

3) 0

4) 1

5) -1

6) $-\infty$

7) ∞

Exercise 5

Between the months t=3 and t=8
, the funds in certain account (in millions of euros) are given by the function $F(t) = -2 + 168t - 33t^2 + 2t^3$.

Determine the interval where the temperature oscillates between the months t=3 and t=6.

1) It oscillates between 260 and 265.

2) It oscillates between 243 and 270.

3) It oscillates between 243 and 270.

4) It oscillates between 250 and 264.

5) It oscillates between 250 and 270.

Exercise 6

In a fish farm, data of precedings years reveal that, if the initial number of fishes is x (x in thousands), after one month they reproduce until a number of $f(x)=\frac{49\,x}{4+8\,x}$ fishes.

What number of fishes leads to the largest increase in the number of animals, $f(x)-x$?

1) $\frac{5}{4}$

2) $\frac{13}{14}$

3) $\frac{15}{8}$

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

5) $\frac{13}{10}$

Exercise 7

The yield of a tree plantation is given by $f(x)=\frac{-31+27\,x+26\,x^2}{39\,x^2}$, where x is the distance in meters between two trees.

What is the distance x that leads to the largest yield.

1) $\frac{19}{13}$

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

3) $\frac{62}{27}$

4) 1

5) $\frac{9}{5}$

Exercise 8

Study the differentiability of the function $f(x)=\begin{cases} 2\sin(x+2)-3\cos(x+2)+3 & x\le -2 \\ 6-\frac{x^2}{2} & -2<x<0 \\ -x+(x+1)\log(x+1)+6 & 0\le x \end{cases}$

1) The function is differentiable for all points.

2) The function is not differentiable at any point.

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

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

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

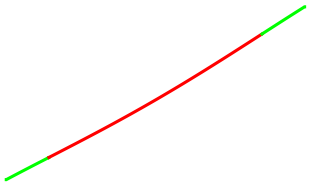
Mathematics 1 - ADE/FyCo - 2020/2021
List of exercises 02-Derivatives for identity number: 20705551589

Exercise 1

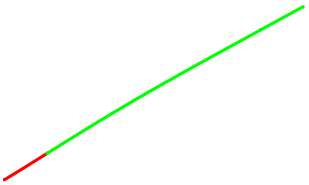
Study the shape properties of $f(x)=1+12x^2+10x^3+4x^4+\frac{3x^5}{5}$

to decide which amongst the following ones is the representation of the function.

1)

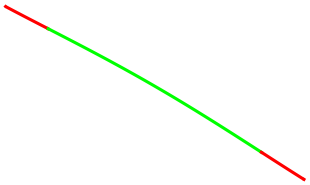


2)



3)

4)



● Big point: maximum

• Small point: minimum

Red line: convexity

Green line: concavity

Indication: To solve this exercise it is necessary to determine the concavity and convexity interval. To find the inflexion points separating the cancavity and convexity intervals, check (by means of Ruffini) with the points −2, −1, 0, 1, 2.

Exercise 2

Determine the derivative of the function $f(t)=3\log(t+1)$ and compute its value at the point $t=0$.

1) $f'(0)=4$ 2) $f'(0)=3$ 3) $f'(0)=0$ 4) $f'(0)=-3$

Exercise 3

Compute the limit: $\lim_{x\to 1} \frac{\frac{137}{20} - 15x + 15x^2 - 10x^3 + \frac{15x^4}{4} - \frac{3x^5}{5} + \text{Log}\left[x^3\right]}{1 - 6x + 15x^2 - 20x^3 + 15x^4 - 6x^5 + x^6}$

1) 0

2) 1

3) $-\infty$

4) -1

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

6) ∞

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

Exercise 4

Compute the limit: $\lim_{x\to 3} \frac{27 - 9x - 3x^2 + x^3}{-9 + 15x - 7x^2 + x^3}$

1) $-\infty$

2) ∞

3) -2

4) -1

5) 1

6) 0

7) 3

Exercise 5

Between the months t=4 and t=8
, the true value of the shares of a company (in euros) are given by the function $C(t) = 195 + 120t - 27t^2 + 2t^3$.

Determine the interval where the value oscillates between the months t=6 and t=8.

1) It oscillates between 381 and 457.

2) It oscillates between 375 and 451.

3) It oscillates between 370 and 451.

4) It oscillates between 370 and 460.

5) It oscillates between 370 and 371.

Exercise 6

In a fish farm, data of precedings years reveal that, if the initial number of fishes is x (x in thousands), after one month they reproduce until a number of $f(x)=\frac{27\,x}{3+30\,x}$ fishes.

What number of fishes leads to the largest increase in the number of animals, f(x)−x?

1) $\frac{31}{16}$

2) $\frac{19}{20}$

3) $\frac{13}{18}$

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

5) $\frac{11}{3}$

Exercise 7

The yield of a tree plantation is given by $f(x)=\frac{-24+12\,x+44\,x^2}{49\,x^6}$, where x is the distance in meters between two trees.

What is the distance x that leads to the largest yield.

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

2) $\frac{5}{14}$

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

4) $\frac{11}{6}$

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

Exercise 8

Study the differentiability of the function $f(x)=\begin{cases} -2\left(e^x+\cos(x)-1\right) & x\le 0 \\ -2\left(-\sin(x)+\cos(x)+x\left(1+\sin(2)+\cos(2)\right)\right) & 0<x<2 \\ 2\sin(2-x)-3\cos(2-x)-1-2\sin(2)-6\cos(2) & 2\le x \end{cases}$

1) The function is differentiable for all points.

2) The function is not differentiable at any point.

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

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

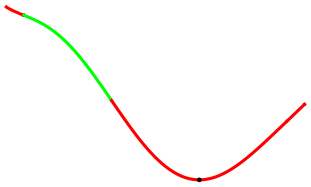
5) The function is differentiable for all points except for x=0 and x=2.

Mathematics 1 - ADE/FyCo - 2020/2021
List of exercises 02-Derivatives for identity number: 20714551324

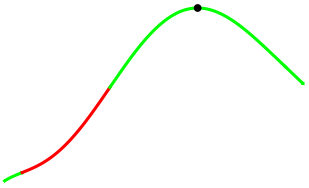
Exercise 1

Study the shape properties of $f(x)=5+60\,x^2-10\,x^3-15\,x^4+3\,x^5+2\,x^6$ to decide which amongst the following ones is the representation of the function.

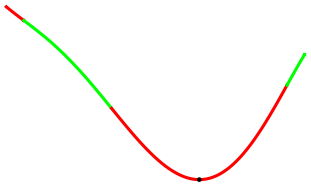
1)



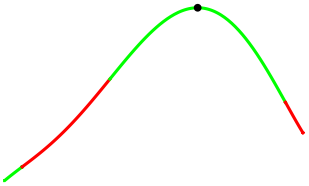
2)



3)



4)



 Big point: maximum

 Small point: minimum

 Red line: convexity

 Green line: concavity

Indication: To solve this exercise it is necessary to determine the concavity and convexity interval. To find the inflexion points separating the cancavity and convexity intervals, check (by means of Ruffini) with the points −2, −1, 0, 1, 2.

Exercise 2

Determine the derivative of the function $f(t)=-e^t\cos(t)$ and compute its value at the point t=0.

1) $f'(0)=-1$ 2) $f'(0)=4$ 3) $f'(0)=2$ 4) $f'(0)=0$

Exercise 3

Compute the limit: $\lim_{x\to 0}\frac{-1+\frac{x^2}{2}+\text{Cos}[x]}{x^3}$

1) ∞

2) 1

3) 0

4) -1

5) $-\frac{1}{3}$

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

7) $-\infty$

Exercise 4

Compute the limit: $\lim_{x\to -1}\frac{-3-2x+x^2}{x+x^2}$

1) 0

2) -1

3) 1

4) $-\infty$

5) 4

6) ∞

7) -2

Exercise 5

Between the months t=0 and t=5 , the true value of the shares of a company (in euros) are given by the function $C(t)=40+18t-12t^2+2t^3$.

Determine the interval where the value oscillates between the months t=0 and t=1.

1) It oscillates between 40 and 48.

2) It oscillates between 49 and 58.

3) It oscillates between 33 and 46.

4) It oscillates between 47 and 41.

5) It oscillates between 40 and 80.

Exercise 6

In a fish farm, data of precedings years reveal that, if the initial number of fishes is x (x in thousands), after one month they reproduce until a number of $f(x)=\frac{36\,x}{1+9\,x}$ fishes.

What number of fishes leads to the largest increase in the number of animals, $f(x)-x$?

1) $\frac{39}{8}$

2) 12

3) $\frac{5}{9}$

4) $\frac{12}{5}$

5) 10

Exercise 7

The yield of a tree plantation is given by $f(x)=\frac{-10+24\,x+32\,x^2}{31\,x^7}$, where x is the distance in meters between two trees.

What is the distance x that leads to the largest yield.

1) $\frac{26}{3}$

2) $\frac{16}{9}$

3) $\frac{6}{13}$

4) $\frac{7}{20}$

5) $\frac{5}{2}$

Exercise 8

Study the differentiability of the function $f(x)=\begin{cases} 2\,e^{x-1}+3\sin(1)\sin(x)+3\cos(1)\cos(x)-1 & x\leq 1 \\ 5\,x-3\,x\log(x)-1 & 1<x<2 \\ -\sin(2-x)+2\cos(2-x)+7-6\log(2) & 2\leq x \end{cases}$

1) The function is differentiable for all points.

2) The function is not differentiable at any point.

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

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

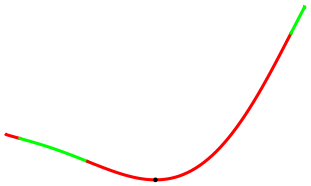
5) The function is differentiable for all points except for x=1 and x=2.

Mathematics 1 - ADE/FyCo - 2020/2021
List of exercises 02-Derivatives for identity number: 20730551515

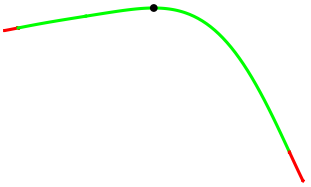
Exercise 1

Study the shape properties of $f(x) = 2 - 120\,x^2 - 80\,x^3 - 15\,x^4 + 6\,x^5 + 2\,x^6$ to decide which amongst the following ones is the representation of the function.

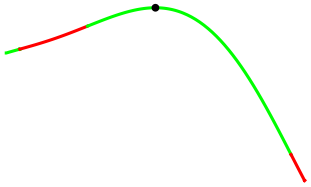
1)



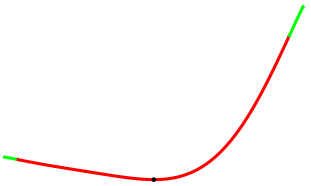
2)



3)



4)



● Big point: maximum

• Small point: minimum

Red line: convexity

Green line: concavity

Indication: To solve this exercise it is necessary to determine the concavity and convexity interval. To find the inflexion points separating the cancavity and convexity intervals, check (by means of Ruffini) with the points −2, −1, 0, 1, 2.

Exercise 2

Determine the derivative of the function $f(t) = 2\cos(t) - \log(\log(t+1)+1)$ and compute its value at the point t=0.

1) $f'(0) = -1$ 2) $f'(0) = -3$ 3) $f'(0) = 2$ 4) $f'(0) = -4$

Exercise 3

Compute the limit: $\lim_{x \to 1} \frac{1 - x + \text{Log}[x]}{1 - 2x + x^2}$

1) -2

2) 0

3) ∞

4) $-\infty$

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

6) 1

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

Exercise 4

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

1) 0

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

3) -2

4) ∞

5) 1

6) $-\infty$

7) -1

Exercise 5

Between the months t=3 and t=9
, the true value of the shares of a company (in euros) are given by the function $C(t) = 519 + 270\,t - 42\,t^2 + 2\,t^3$.

Determine the interval where the value oscillates between the months t=3 and t=4.

1) It oscillates between 996 and 1049.

2) It oscillates between 1005 and 1061.

3) It oscillates between 1005 and 1055.

4) It oscillates between 1005 and 1069.

5) It oscillates between 1005 and 1069.

Exercise 6

In a fish farm, data of precedings years reveal that, if the initial number of fishes is x (x in thousands), after one month they reproduce until a number of $f(x)=\frac{16\,x}{9+44\,x}$ fishes.

What number of fishes leads to the largest increase in the number of animals, f(x)−x?

1) $\frac{3}{44}$

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

3) 33

4) $\frac{29}{2}$

5) $\frac{19}{10}$

Exercise 7

The yield of a tree plantation is given by $f(x)=\frac{-24+19\,x+36\,x^2}{19\,x^7}$, where x is the distance in meters between two trees.

What is the distance x that leads to the largest yield.

1) 17

2) $\frac{38}{17}$

3) $\frac{26}{7}$

4) $\frac{5}{4}$

5) $\frac{7}{10}$

Exercise 8

Study the differentiability of the function $f(x)=\begin{cases} -e^{x-1}-5 & x\le 1 \\ \frac{1}{3}\,(x\,(2\,x-7)-13) & 1<x<4 \\ 2\,e^{x-4}-5 & 4\le x \end{cases}$

1) The function is differentiable for all points.

2) The function is not differentiable at any point.

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

4) The function is differentiable for all points except for x=4.

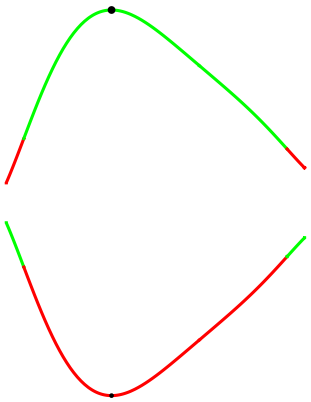
5) The function is differentiable for all points except for x=1 and x=4.

Mathematics 1 - ADE/FyCo - 2020/2021
List of exercises 02-Derivatives for identity number: 20902651249

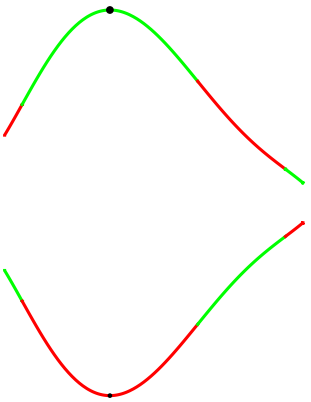
Exercise 1

Study the shape properties of $f(x)=4-60x^2+30x^3+5x^4-9x^5+2x^6$
to decide which amongst the following ones is the representation of the function.

1)



2)



3)

4)

● Big point: maximum

• Small point: minimum

—— Red line: convexity

—— Green line: concavity

Indication: To solve this exercise it is necessary to determine the concavity and convexity interval. To find the inflexion points separating the cancavity and convexity intervals, check (by means of Ruffini) with the points −2, −1, 0, 1, 2.

Exercise 2

Determine the derivative of the function $f(t)=\log(t+1)-4\sin\left(e^t\right)$ and compute its value at the point t=0.

1) f'(0)=1−4 Cos[1] 2) f'(0)=0 3) f'(0)=2 4) f'(0)=−2

Exercise 3

Compute the limit: $\lim_{x\to 0} \frac{-1 + \frac{x^4}{2} + \cos\left[x^2\right]}{x^5}$

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

2) $-\infty$

3) 1

4) $-\frac{1}{3}$

5) 0

6) ∞

7) -2

Exercise 4

Compute the limit: $\lim_{x\to 3} \frac{9x - 6x^2 + x^3}{-3 - 2x + x^2}$

1) -1

2) -2

3) $-\infty$

4) ∞

5) 1

6) 0

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

Exercise 5

Between the months t=3 and t=10
, the true value of the shares of a company (in euros) are given by the function $C(t) = 558 + 288t - 42t^2 + 2t^3$.

Determine the interval where the value oscillates between the months t=5 and t=10.

1) It oscillates between 1198 and 1238.

2) It oscillates between 1203 and 1241.

3) It oscillates between 1098 and 1238.

4) It oscillates between 1202 and 1228.

5) It oscillates between 1198 and 1206.

Exercise 6

In a fish farm, data of precedings years reveal that, if the initial number of fishes is x (x in thousands), after one month they reproduce until a number of $f(x)=\frac{18\,x}{2+18\,x}$ fishes.

What number of fishes leads to the largest increase in the number of animals, $f(x)-x$?

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

2) $\frac{6}{5}$

3) $\frac{24}{17}$

4) $\frac{19}{12}$

5) $\frac{2}{9}$

Exercise 7

The yield of a tree plantation is given by $f(x)=\frac{-35+5\,x+x^2}{14\,x^5}$, where x is the distance in meters between two trees.

What is the distance x that leads to the largest yield.

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

2) $\frac{5}{7}$

3) 5

4) $\frac{13}{3}$

5) 31

Exercise 8

Study the differentiability of the function $f(x)=\begin{cases} e^{x+1}-2\cos(x+1)-1 & x\le -1 \\ (x+2)\,(2\log(x+2)-1) & -1<x<2 \\ -e^{x-2}+1+8\log(4) & 2\le x \end{cases}$

1) The function is differentiable for all points.

2) The function is not differentiable at any point.

3) The function is differentiable for all points except for x=−1.

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

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

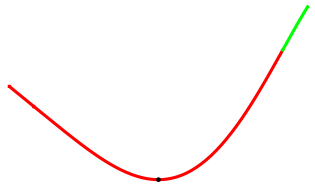
Mathematics 1 - ADE/FyCo - 2020/2021
List of exercises 02-Derivatives for identity number: 21130550766

Exercise 1

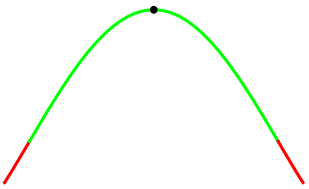
Study the shape properties of $f(x)=3-6x^2-2x^3+x^4+\frac{3x^5}{5}$

to decide which amongst the following ones is the representation of the function.

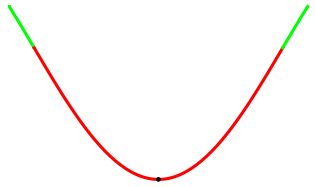
1)



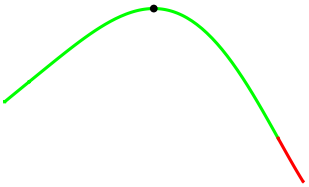
2)



3)



4)



● Big point: maximum

• Small point: minimum

Red line: convexity

Green line: concavity

Indication: To solve this exercise it is necessary to determine the concavity and convexity interval. To find the inflexion points separating the cancavity and convexity intervals, check (by means of Ruffini) with the points −2, −1, 0, 1, 2.

Exercise 2

Determine the derivative of the function $f(t)=\log(t+1)\left(t^2-3\log\left(t^2+1\right)\right)$ and compute its value at the point t=0.

1) $f'(0)=2$ 2) $f'(0)=-1$ 3) $f'(0)=4$ 4) $f'(0)=0$

Exercise 3

Compute the limit: $\lim_{x \to 0} \frac{-1 + e^{x^3} - x^3}{x^5}$

1) -2

2) ∞

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

4) $-\infty$

5) 0

6) -1

7) 1

Exercise 4

Compute the limit: $\lim_{x \to 3} \frac{18 - 3x - 4x^2 + x^3}{3 - 4x + x^2}$

1) -1

2) $-\infty$

3) -2

4) 1

5) ∞

6) 0

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

Exercise 5

Between the months $t=4$ and $t=11$, the true value of the shares of a company (in euros) are given by the function $C(t) = 797 + 336t - 45t^2 + 2t^3$.

Determine the interval where the value oscillates between the months $t=6$ and $t=10$.

1) It oscillates between 1616 and 1667.

2) It oscillates between 1629 and 1630.

3) It oscillates between 1549 and 1710.

4) It oscillates between 1623 and 1655.

5) It oscillates between 1625 and 1657.

Exercise 6

In a fish farm, data of precedings years reveal that, if the initial number of fishes is x (x in thousands), after one month they reproduce until a number of $f(x)=\frac{49\,x}{4+40\,x}$ fishes.

What number of fishes leads to the largest increase in the number of animals, f(x)−x?

1) $\frac{39}{20}$

2) 11

3) $\frac{28}{3}$

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

5) $\frac{6}{5}$

Exercise 7

The yield of a tree plantation is given by $f(x)=\frac{-46+31\,x+39\,x^2}{24\,x^6}$, where x is the distance in meters between two trees.

What is the distance x that leads to the largest yield.

1) $\frac{20}{11}$

2) $\frac{17}{7}$

3) $\frac{6}{17}$

4) $\frac{12}{13}$

5) $\frac{6}{5}$

Exercise 8

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

1) The function is differentiable for all points.

2) The function is not differentiable at any point.

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

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

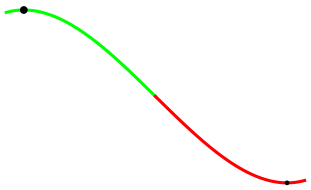
5) The function is differentiable for all points except for x=0 and x=3.

Mathematics 1 - ADE/FyCo - 2020/2021
List of exercises 02-Derivatives for identity number: 30216550613

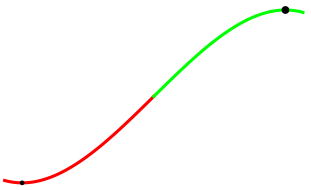
Exercise 1

Study the shape properties of the $f(x)=1-24x-18x^2+3x^4$
to decide which amongst the following ones is the representation of the function.

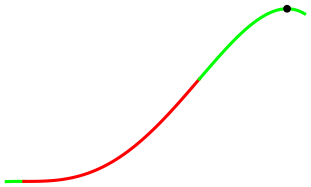
1)



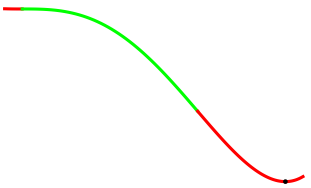
2)



3)



4)



● Big point: maximum

• Small point: minimum

Red line: convexity

Green line: concavity

Indication: To find the maximun and minimum points of the function,
try (with Ruffini) the points −2, −1, 0, 1, 2. To solve this exercise
it is necessary to determine the increasing and decreasing intervals.

Exercise 2

Determine the derivative of the function $f(t)=t^2$ and compute its value at the point $t=0$.

1) $f'(0)=2$ 2) $f'(0)=0$ 3) $f'(0)=-1$ 4) $f'(0)=-2$

Exercise 3

Compute the limit: $\lim_{x\to 0}\frac{-x+\frac{x^3}{6}+\text{Sin}[x]}{x^4}$

1) 1

2) 0

3) $-\infty$

4) -1

5) ∞

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

7) -2

Exercise 4

Compute the limit: $\lim_{x\to -1}\frac{3+7x+5x^2+x^3}{-1+x^2}$

1) $-\infty$

2) -2

3) -1

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

5) 1

6) 0

7) ∞

Exercise 5

Between the months t=3 and t=10
, the funds in certain account (in millions of euros) are given by the function $F(t)=-19+420\,t-51\,t^2+2\,t^3$.

Determine the interval where the temperature oscillates between the months t=3 and t=8.

1) It oscillates between 1081 and 1108.

2) It oscillates between 841 and 1115.

3) It oscillates between 836 and 1108.

4) It oscillates between 830 and 1106.

5) It oscillates between 836 and 1104.

Exercise 6

In a fish farm, data of precedings years reveal that, if the initial number of fishes is x (x in thousands), after one month they reproduce until a number of $f(x)=\frac{36\,x}{16+30\,x}$ fishes.

What number of fishes leads to the largest increase in the number of animals, $f(x)-x$?

1) $\frac{4}{17}$

2) 2

3) $\frac{19}{13}$

4) $\frac{4}{15}$

5) $\frac{5}{12}$

Exercise 7

The yield of a tree plantation is given by $f(x)=\frac{-15+41\,x+49\,x^2}{18\,x^2}$, where x is the distance in meters between two trees.

What is the distance x that leads to the largest yield.

1) 6

2) $\frac{33}{19}$

3) $\frac{9}{19}$

4) $\frac{30}{41}$

5) 8

Exercise 8

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

1) The function is differentiable for all points.

2) The function is not differentiable at any point.

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

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

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

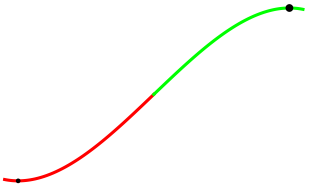
Mathematics 1 - ADE/FyCo - 2020/2021
List of exercises 02-Derivatives for identity number: 30312650522

Exercise 1

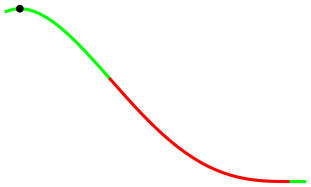
Study the shape properties of the $f(x)=3+96x-24x^2-8x^3+3x^4$
to decide which amongst the following ones is the representation of the function.

1)

2)



3)



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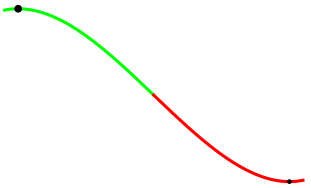


● Big point: maximum

• Small point: minimum

Red line: convexity

Green line: concavity

Indication: To find the maximun and minimum points of the function,
try (with Ruffini) the points −2, −1, 0, 1, 2. To solve this exercise
it is necessary to determine the increasing and decreasing intervals.

Exercise 2

Determine the derivative of the function $f(t)=$
$e^t-\log(t+1)+\sin(t)+3$ and compute its value at the point t=0.

1) $f'(0)=4$ 2) $f'(0)=3$ 3) $f'(0)=1$ 4) $f'(0)=0$

Exercise 3

Compute the limit: $\lim_{x \to 0} \frac{-1 + \frac{x^2}{2} + \text{Cos}[x]}{x^4}$

1) 0

2) $\frac{1}{24}$

3) $-\infty$

4) 1

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

6) ∞

7) -1

Exercise 4

Compute the limit: $\lim_{x \to 1} \frac{x - 2x^2 + x^3}{2 - 3x + x^2}$

1) -2

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

3) 0

4) 1

5) ∞

6) $-\infty$

7) -1

Exercise 5

Between the months t=4 and t=9 , the funds in certain account (in millions of euros) are given by the function $F(t) = 7 + 120t - 27t^2 + 2t^3$.

Determine the interval where the temperature oscillates between the months t=5 and t=6.

1) It oscillates between 182 and 187.

2) It oscillates between 182 and 183.

3) It oscillates between 182 and 358.

4) It oscillates between 191 and 178.

5) It oscillates between 176 and 192.

Exercise 6

In a fish farm, data of precedings years reveal that, if the initial number of fishes is x (x in thousands), after one month they reproduce until a number of $f(x)=\frac{32\,x}{18+26\,x}$ fishes.

What number of fishes leads to the largest increase in the number of animals, f(x)−x?

1) $\frac{28}{9}$

2) $\frac{39}{8}$

3) $\frac{13}{16}$

4) $\frac{3}{13}$

5) $\frac{36}{19}$

Exercise 7

The yield of a tree plantation is given by $f(x)=\frac{-5+33\,x+4\,x^2}{22\,x^2}$, where x is the distance in meters between two trees.

What is the distance x that leads to the largest yield.

1) $\frac{28}{9}$

2) $\frac{39}{8}$

3) $\frac{25}{17}$

4) $\frac{10}{33}$

5) $\frac{36}{19}$

Exercise 8

Study the differentiability of the function $f(x)=\begin{cases} -2\sin(x)+3\cos(x)+3 & x\le 0 \\ -x-\sin(x)+3\cos(x)+5 & 0<x<1 \\ -2\,e^{x-1}-2\cos(1-x)+8-\sin(1)+3\cos(1) & 1\le x \end{cases}$

1) The function is differentiable for all points.

2) The function is not differentiable at any point.

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

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

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

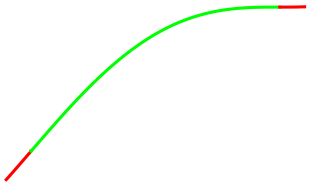
Mathematics 1 - ADE/FyCo - 2020/2021
List of exercises 02-Derivatives for identity number: 30509500045

Exercise 1

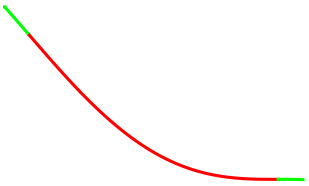
Study the shape properties of $f(x)=5+8x^3+4x^4+\frac{3x^5}{5}$

to decide which amongst the following ones is the representation of the function.

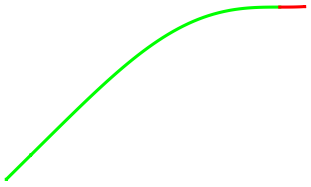
1)



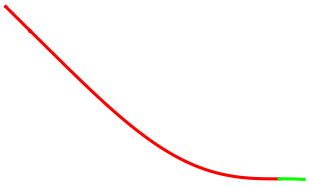
2)



3)



4)



● Big point: maximum

• Small point: minimum

Red line: convexity

Green line: concavity

Indication: To solve this exercise it is necessary to determine the concavity and convexity interval. To find the inflexion points separating the cancavity and convexity intervals, check (by means of Ruffini) with the points −2, −1, 0, 1, 2.

Exercise 2

Determine the derivative of the function $f(t)=-2\sin(t)\sin(\log(t+1))$ and compute its value at the point t=0.

1) $f'(0)=0$ 2) $f'(0)=-1$ 3) $f'(0)=-3$ 4) $f'(0)=-2$

Exercise 3

Compute the limit: $\lim_{x\to 0}\frac{-x^3+\text{Sin}\left[x^3\right]}{x^6}$

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

2) 1

3) $-\infty$

4) $-\frac{1}{3}$

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

6) ∞

7) 0

Exercise 4

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

1) $-\infty$

2) $\frac{2}{5}$

3) -1

4) -2

5) 1

6) 0

7) ∞

Exercise 5

Between the months t=4 and t=8
, the true value of the shares of a company (in euros) are given by the function $C(t)=306+180\,t-33\,t^2+2\,t^3$.

Determine the interval where the value oscillates between the months t=6 and t=8.

1) It oscillates between 626 and 658.

2) It oscillates between 630 and 631.

3) It oscillates between 630 and 658.

4) It oscillates between 635 and 664.

5) It oscillates between 625 and 662.

Exercise 6

In a fish farm, data of precedings years reveal that, if the initial number of fishes is x (x in thousands), after one month they reproduce until a number of $f(x)=\frac{25\,x}{9+13\,x}$ fishes.

What number of fishes leads to the largest increase in the number of animals, f(x)−x?

1) 20

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

3) $\frac{22}{5}$

4) $\frac{37}{7}$

5) $\frac{6}{13}$

Exercise 7

The yield of a tree plantation is given by $f(x)=\frac{-1+18\,x+45\,x^2}{38\,x^4}$, where x is the distance in meters between two trees.

What is the distance x that leads to the largest yield.

1) $\frac{10}{11}$

2) $\frac{37}{8}$

3) $\frac{4}{13}$

4) $\frac{1}{15}$

5) $\frac{10}{19}$

Exercise 8

Study the differentiability of the function $f(x)=\begin{cases} e^{x+2}+3\cos(x+2)+4 & x\le -2 \\ \frac{1}{6}\,((x-2)\,x+40) & -2<x<1 \\ \cos(1-x)+\frac{21}{2} & 1\le x \end{cases}$

1) The function is differentiable for all points.

2) The function is not differentiable at any point.

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

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

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