University of Biskra
Biology Department
Module: Math-stat

First year license
2025/2026

Interrogation N$^\circ$ 02

Exercise 1 ***(2 pts)***

Lets **f** a function defined by:

$$f(x) = \begin{cases} x^2 + 2x, & x \geq 1, \\ \\ -x + 4, & x < 1. \end{cases}$$

Determine the set of points where **f** is differentiable?
Determine $f'(x)$ where **f** is differentiable ?

Exercise 2 ***(2 pts)***

Find numbers A and B where:

$$\frac{1}{(x-1)(x+1)} = \frac{A}{x-1} + \frac{B}{x+1}$$

Evaluate the following integral:

$$\int \frac{1}{(x-1)(x+1)} dx.$$

Exercise 3 ***(6 pts)****:* Suppose that the statistical distribution of the number of rooms per dwelling in a certain locality is given as follows:

Number of rooms x_i	1	2	3	4	5	6
Number of dwellings n_i	5	10	20	30	25	10

1. Determine the variable studied and its nature.
2. Determine the sample size.
3. Represent this distribution using the appropriate diagram.
4. Fill the frequency table(relative frequency f_i, increasing cumulative frequency)

Good luck

Corrigé type S1

Exo 1:

$f(x)$ is a polynomial function therefore it is differentiable on $]-\infty, 1[$ and $]1, +\infty[$.

It remains to verify the differentiability at point "1"

$$\lim_{x \overset{>}{\to} 1} \frac{f(x) - f(1)}{x - 1} = \lim_{x \overset{>}{\to} 1} \frac{x^2 + 2x - 3}{x - 1} = \frac{0}{0} \quad \left(\text{Hopital's rule}\right)$$

0,5

$$= \lim_{x \overset{>}{\to} 1} \frac{2x + 2}{1} = 4. \quad \left(\underset{\text{exists}}{\exists}\right)$$

$$\lim_{x \overset{<}{\to} 1} \frac{f(x) - f(1)}{x - 1} = \lim_{x \overset{<}{\to} 1} \frac{-x + 4 - 3}{x - 1} = \lim_{x \overset{<}{\to} 1} \frac{-(x-1)}{(x-1)}$$

$$= -1. \quad (\exists)$$

0,5

but $\displaystyle \lim_{x \overset{>}{\to} 1} \frac{f(x) - f(1)}{x - 1} \neq \lim_{x \overset{<}{\to} 1} \frac{f(x) - f(1)}{x - 1}$

0,25

$\Rightarrow$ f is not differentiable at point 1

$\Rightarrow$ f is differentiable on $\mathbb{R} \setminus \{1\}$. 0,25

$$f'(x) = \begin{cases} 2x + 2 & \text{if } x > 1 \quad 0,25 \\ -1 & \text{if } x < 1 \quad 0,25 \end{cases}$$

Exo 2

Find A and B:

$$\frac{A}{(x-1)} + \frac{B}{(x+1)} = \frac{A(x+1)+B(x-1)}{(x-1)(x+1)} = \frac{(A+B)x + A - B}{(x-1)(x+1)}$$

$$\begin{cases} A+B=0 \\ A-B=1 \end{cases} \Rightarrow A = \frac{1}{2},\ B = -\frac{1}{2}.$$ 1

$$\frac{1}{(x-1)(x+1)} = \frac{1}{2}\cdot\frac{1}{(x-1)} - \frac{1}{2}\frac{1}{(x+1)}$$

$$\int \frac{1}{(x+1)(x-1)}\,dx = \int \frac{1}{2}\cdot\frac{1}{x-1} - \frac{1}{2}\frac{1}{(x+1)}\,dx$$ 1

$$= \frac{1}{2}\int \frac{1}{x-1}\,dx - \frac{1}{2}\int \frac{1}{(x+1)}\,dx$$

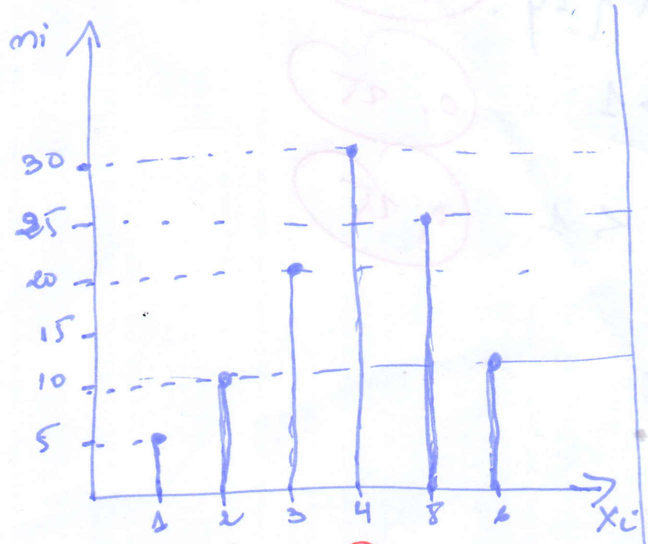
$$= \frac{1}{2}\ln|x-1| - \frac{1}{2}\ln|x+1| + c.$$

Exo 3

1)
* The variable studied is: Number of rooms 0,5
* Quantitative discret 0,5

2) the sample size: $N = 100$. 1

3)



Bar graph. 2

4)

x_i	n_i	f_i	F_i
1	5	0,05	0,05
2	10	0,10	0,15
3	20	0,20	0,35
4	30	0,30	0,65
5	25	0,25	0,90
6	10	0,10	1
Total	100	1	

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