

Exercise 1

Determine an antiderivative (primitive) of the proposed function f on the given interval I :

- 1 $f(x) = x^2 - 5x + \frac{1}{x}$ on $I =]0; +\infty[$.
- 2 $f(x) = \frac{x^2+x+1}{x}$ on $I =]0; +\infty[$.
- 3 $f(x) = \frac{7}{x} + \frac{5}{\sqrt{x}} + \frac{1}{x^2}$ on $I =]0; +\infty[$.
- 4 $f(x) = \frac{3}{3x-4}$ on $I =]\frac{4}{3}; +\infty[$.
- 5 $f(x) = \frac{1}{x+1}$ on $I =]-1; +\infty[$.
- 6 $f(x) = \frac{1}{x+1}$ on $I =]-\infty; -1[$.
- 7 $f(x) = \frac{2x}{x^2-4}$ on $]2; +\infty[$, (Supplementary).
- 8 $f(x) = \frac{1}{3x-5}$ on $[2; +\infty[$, (Supplementary).
- 9 $f(x) = \frac{x+1}{x^2+2x+2}$ on $\mathbb{R}$, (Supplementary).
- 10 $f(x) = \frac{x}{x^2-1}$ on $] -1; 1[$, (Supplementary).

Exercise 2

Compute by integration by parts the integrals:

- 1 $\int x \cdot \sin(x)$
- 2 $\int x \cdot e^x$
- 3 $\int x^2 \cdot \ln(x)$
- 4 $\int \ln(x)$

Exercise 3

An experiment was conducted on 250 people to study the relationship between age X and sleeping time Y . The following table was obtained :

X	[5, 7[	[7, 9[	[9, 11[	[11, 15[
[1, 3[	0	0	2	36
[3, 11[	0	3	12	26
[11, 19[	2	8	35	16
[19, 31[	0	26	22	3
[31, 59[	22	15	6	0

- 1 Compute the marginal means and marginal standard deviations of X and Y .
- 2 Determine the covariance and the linear correlation coefficient.
- 3 Determine the regression line of Y as a function of X .
- 4 Estimate the sleeping time of a 66-year-old person.

Exercise 4

The measurements of the number X of rainy days and the rainfall height Y (in mm) in Paris every 5 years between 1960 and 1995 are summarized in the following table.

year	1960	1965	1970	1975	1980	1985	1990	1995
X	198	196	199	164	170	163	149	162
Y	739	880	631	658	690	501	501	670

- 1 Plot the scatter plot.
- 2 Compute the correlation coefficient.
- 3 Is there a relationship between variables X and Y ?

Exercise 5 (Supplementary)

In this exercise, we will work with two variables, the concentration of nutrients in the soil (X) and the growth of a plant (Y) in centimeters after 60 days of experimentation. Here are the collected data:

Sample	Nutrient Concentration (X)	Plant Growth (Y)
1	5	8
2	7	9
3	6	8
4	9	11
5	8	10

- 1 Compute the marginal means of X and Y .
- 2 Compute the variance of X and Y .
- 3 Compute the standard deviation of X and Y .
- 4 Compute the covariance between X and Y .
- 5 Compute the correlation coefficient between X and Y .
- 6 Compute the regression line of Y as a function of X .