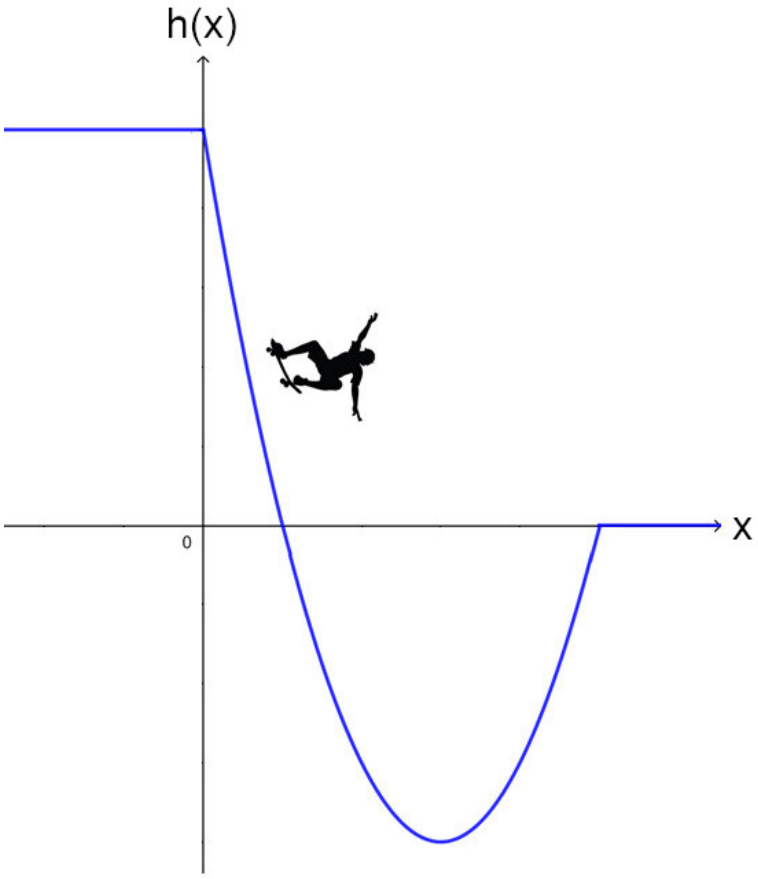
Exercise 1 Calc. : ✗

A skateboarder launches himself on a ramp in a skate park. We assume the position of the skater on the ramp can be given by a point with coordinates $(x; h(x))$ in the following graph:	5 marks



The function h is defined on the interval $[0; 5]$ by:

$$h(x) = x^2 - 6x + 5$$

where $h(x)$ is expressed in metres.

a) **Determine** the height at which the skateboarder launches himself onto the ramp.

b) **Calculate** the value of $h(1)$ and $h(5)$.

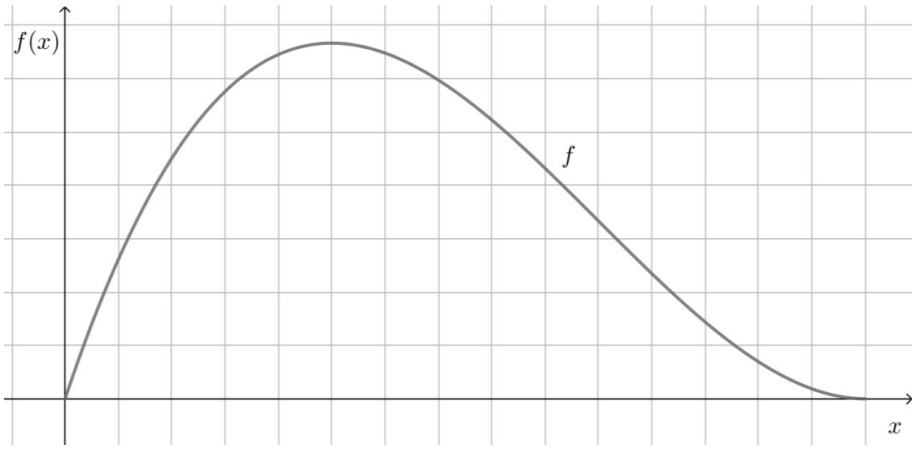
c) **Determine** the set of x values for which the skater is below his end point.

Exercise 2 Calc. : ✗

The profile of a mountain can be modelled by a function f defined by:

$$f(x) = \frac{1}{3}x^3 - 2x^2 + 3x \qquad \text{for } 0 < x < 3$$

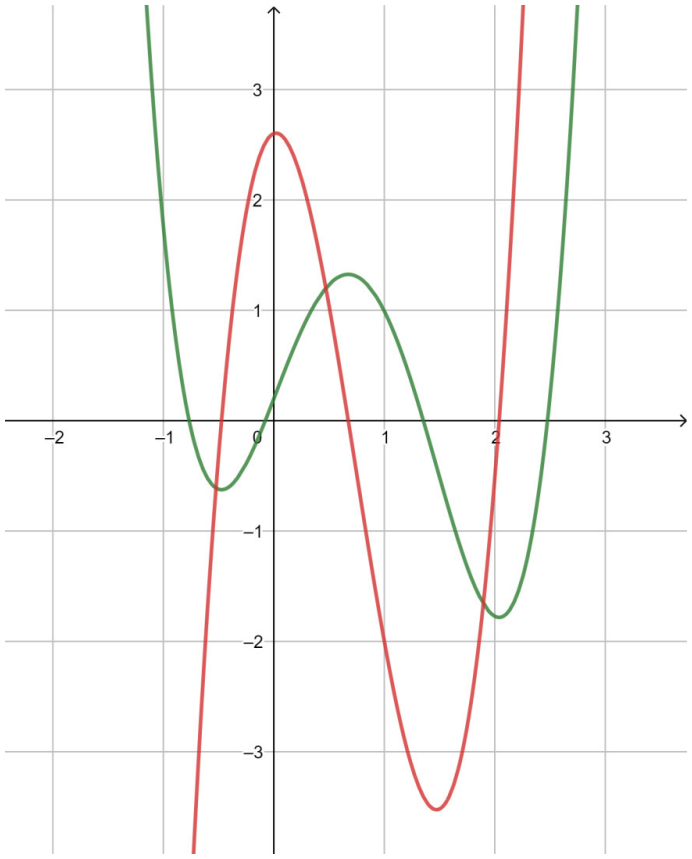
where x is the distance in meters and $f(x)$ is the height in thousands of meters.
We give you the graph that represents this function f:



Determine the height of the mountain, rounded to the nearest hundreds of meters. 5 marks

Exercise 3 Calc. : ✗

The diagram below shows the graph of a function f and that of its derivative function f'.



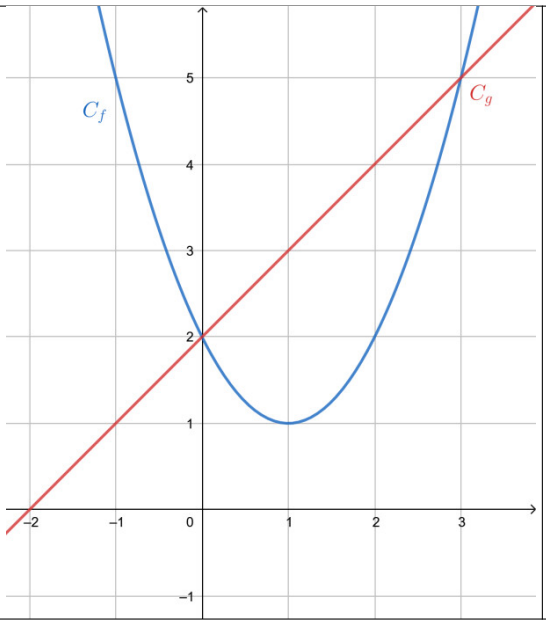
Determine the equation of the tangent to the graph of $f(x)$ in the point with $x = 1$. 5 marks

Exercise 4 Calc. : ✗

Let f and g be functions that are defined as follows:

$$f(x) = x^2 - 2x + 2 \quad \text{and} \quad g(x) = x + 2$$

and shown in the graph on the right.



a) **Explain** what $\int_0^3 |f(x) - g(x)|\,dx$ represents graphically (you can reproduce the graph on your answer sheet and show your answer on the graph).

b) **Calculate** $\int_0^3 |f(x) - g(x)|\,dx$.

5 marks

Exercise 5 Calc. : ✗

The value of an electric vehicle newly purchased can be modeled by the function:

$$V(t) = 40\,000 \times e^{\ln(0.80)t}$$

where $V(t)$ is the value of the vehicle (in euros), t years after purchase.

a) **Identify** the formula equivalent to the formula $V(t)$ among the following 4 proposals V_1, V_2, V_3 and V_4:

$V_1(t) = 40\,000 \times \ln(0.80)t$ $\quad$ $V_2(t) = 40\,000 \times 0.80t$

$V_3(t) = 0.80 \times \ln(40\,000)t$ $\quad$ $V_4(t) = 0.80 \times 40\,000t$

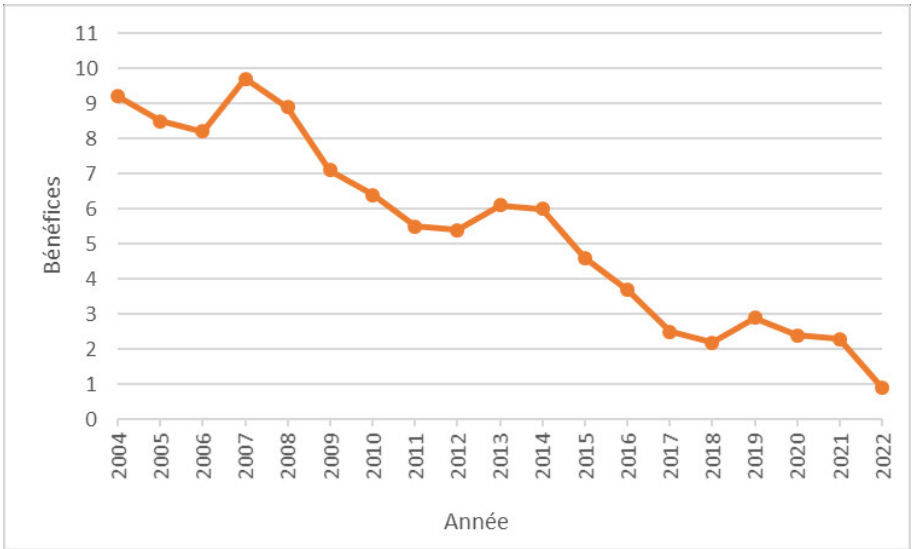
b) **Determine** the initial purchase price of the vehicle (new).

c) **Calculate** the value of the vehicle one year after purchase.

5 marks

Exercise 6 Calc. : ✗

Since 2004, a company's profits have made a worrisome evolution. 5 marks
The profits (in hundreds of thousands of euros) of the last 18 years are shown in the graph below:



a) **Give** the names of the two types of fundamental mathematical models that could be used to model this evolution.

b) **Predict** the future year in which profits will again be at a minimum, if the evolution continues in this way.

c) **Interpret** what will happen to this company between now and 2030, if the evolution continues in this way.

Exercise 7 Calc. : ✗

A waiter, working in a pizzeria, notices that, on average, 40% of the customers are families, the rest are couples. 5 marks
He also notices that:

- Out of 100 families, 70 leave a tip;
- 4 out of 10 couples leave a tip.

We are interested in the following events:

- F: "the table is occupied by a family";
- C: "the table is occupied by a couple";
- T: "The waiter gets a tip."

a) **Present** all the information of the statement in a probability tree or a two-way table.

b) **Determine** the probability that the table was occupied by a family knowing that the waiter received a tip.

Exercise 8 Calc. : ✗

Out of 1500 students at a university, 1200 watch a series during the week, out of which 150 also go to the cinema on weekends.
There are 200 students going to the cinema on weekends, without having watched a series during the week.
Determine if going to the movies on the weekend is dependent on watching a series on weekdays. 5 marks

Exercise 9 Calc. : ✗

An urn contains 2 red balls and 3 white balls. We draw 3 balls at random. — 5 marks

a) Please **indicate** under what condition(s) this situation could be considered as a binomial distribution.

b) Assuming the condition(s) of a) is/are verified, **calculate** the probability of obtaining only red balls at the end of the 3 draws.

Exercise 10 Calc. : ✗

Let X be a random variable.
The table below shows the probability distribution of X:

x_i	10	20	30	40	50
p_i	a	0.01	0.2	$3a$	0.35

Calculate the expected value of the variable X. — 5 marks