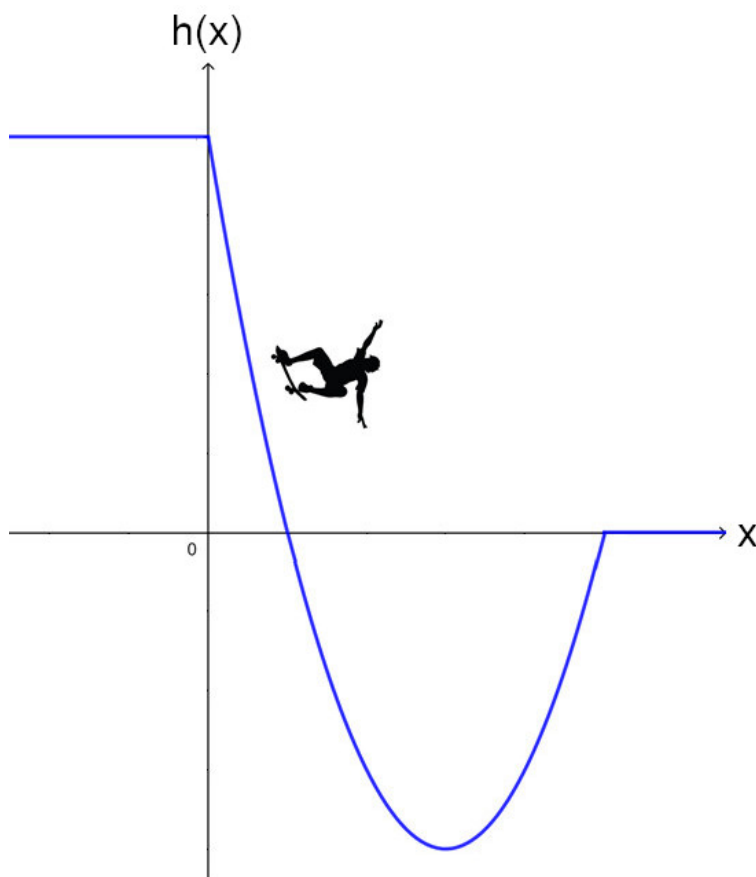


**Exercise 1**Calc. : **X**

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.

- Determine** the height at which the skateboarder launches himself onto the ramp.
- Calculate** the value of  $h(1)$  and  $h(5)$ .
- Determine** the set of  $x$  values for which the skater is below his end point.

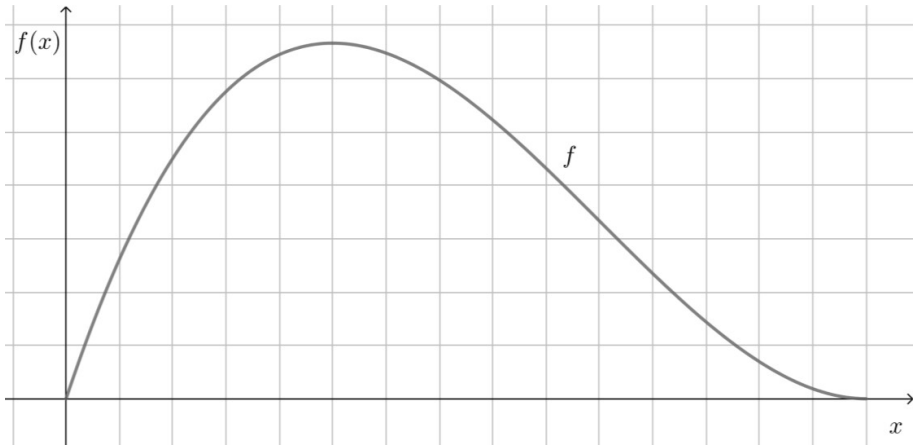
**Exercise 2**

Calc. : ✖

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

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

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  $f$ :



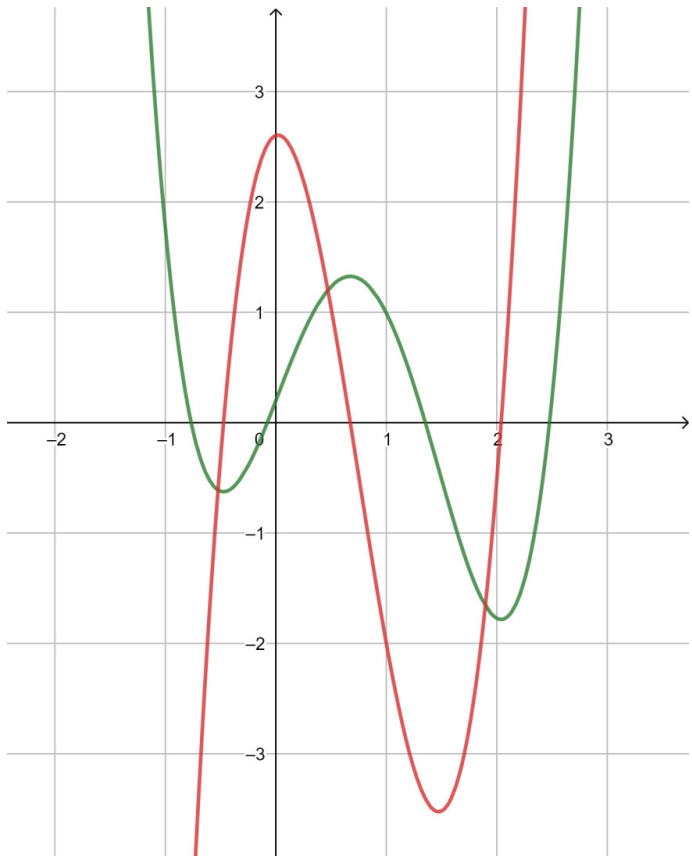
**Determine** the height of the mountain, rounded to the nearest hundreds of meters.

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

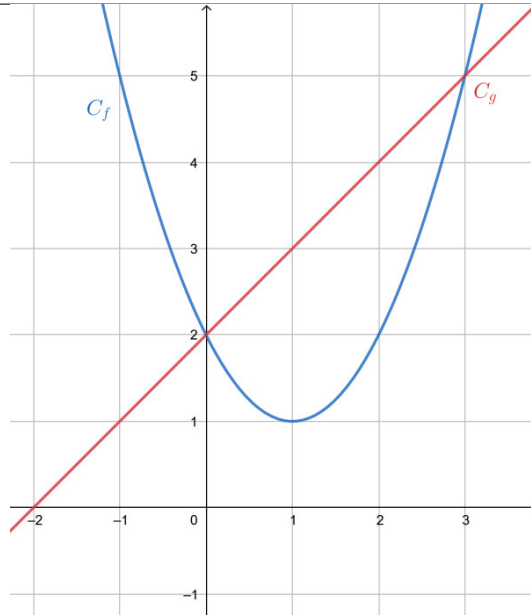
#### Exercise 4

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.



5 marks

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

#### 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  $V_4$ :

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

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

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

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

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

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

5 marks

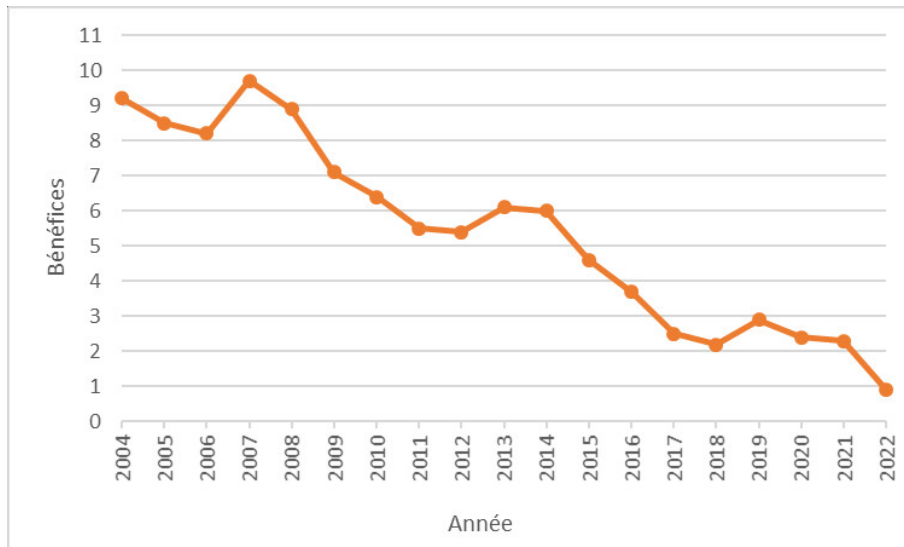
**Exercise 6**

Calc. : ✗

Since 2004, a company's profits have made a worrisome evolution.

The profits (in hundreds of thousands of euros) of the last 18 years are shown in the graph below:

5 marks



- Give** the names of the two types of fundamental mathematical models that could be used to model this evolution.
- Predict** the future year in which profits will again be at a minimum, if the evolution continues in this way.
- 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.

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."

- Present** all the information of the statement in a probability tree or a two-way table.
- Determine** the probability that the table was occupied by a family knowing that the waiter received a tip.

5 marks

**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

<b>Exercise 9</b>	Calc. : <b>X</b>
<p>An urn contains 2 red balls and 3 white balls. We draw 3 balls at random.</p> <p>a) Please <b>indicate</b> under what condition(s) this situation could be considered as a binomial distribution.</p> <p>b) Assuming the condition(s) of a) is/are verified, <b>calculate</b> the probability of obtaining only red balls at the end of the 3 draws.</p>	5 marks

<b>Exercise 10</b>	Calc. : <b>X</b>												
Let $X$ be a random variable. The table below shows the probability distribution of $X$ :													
<table><tr><td><math>x_i</math></td><td>10</td><td>20</td><td>30</td><td>40</td><td>50</td></tr><tr><td><math>p_i</math></td><td><math>a</math></td><td>0.01</td><td>0.2</td><td><math>3a</math></td><td>0.35</td></tr></table>		$x_i$	10	20	30	40	50	$p_i$	$a$	0.01	0.2	$3a$	0.35
$x_i$		10	20	30	40	50							
$p_i$		$a$	0.01	0.2	$3a$	0.35							
<b>Calculate</b> the expected value of the variable $X$ .													
5 marks													