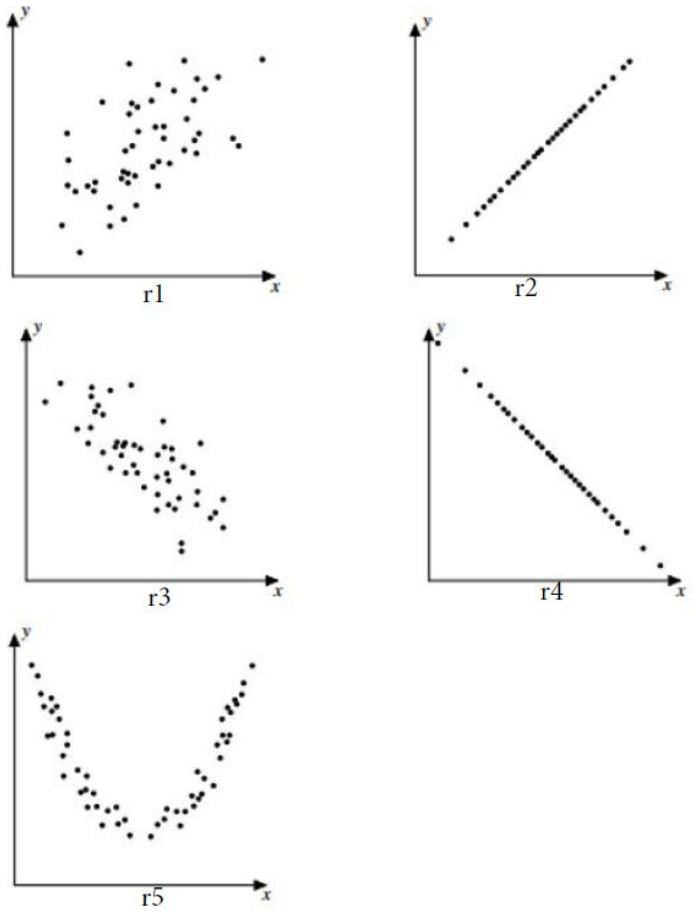
Exercise 1 Calc. : ✗

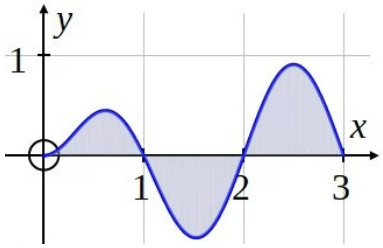
Arrange, by increasing order of size, the linear correlation coefficients, $r1$, $r2$, $r3$, $r4$, and $r5$, seen in these scatter diagrams. **Give reasons** for the order you have identified. *Note that the axes of all the diagrams are to the same scale.*  	5 marks

Exercise 2 Calc. : ✗

In a group of 500 pupils, 200 belong to the chess club, 240 to the reading club and 80 to both clubs. **Calculate** the probability that a pupil chosen at random does not belong to the chess club, given that they do not belong to the reading club.	5 marks

Exercise 3 Calc. : ✗

A new company logo is shown on the right and will be made out of steel to be displayed outside the headquarters.
The curve is defined by the function $y = f(x)$.



a) **Identify** which two of the following integrals would correctly calculate the area of steel required. — 2.5 marks

1. $\int_0^1 f(x)\,\mathrm{d}x + \int_1^2 f(x)\,\mathrm{d}x + \int_2^3 f(x)\,\mathrm{d}x$
2. $\int_0^3 f(x)\,\mathrm{d}x$
3. $\int_0^3 |f(x)|\,\mathrm{d}x$
4. $\int_0^1 f(x)\,\mathrm{d}x - \int_1^2 f(x)\,\mathrm{d}x + \int_2^3 f(x)\,\mathrm{d}x$

b) **Explain** why the other integrals would give an incorrect answer. — 2.5 marks

Exercise 4 Calc. : ✗

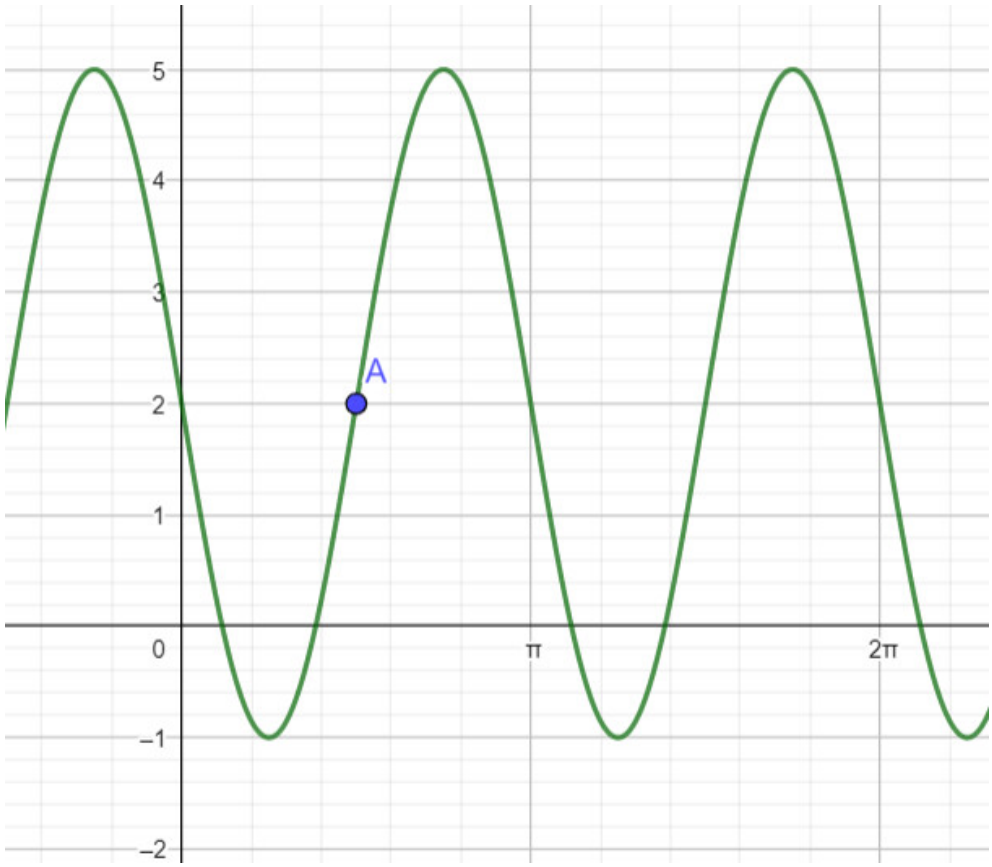
At the start of 2022 a company bought a machine for 100 000 to make plastic items.
Each year the machine loses 20% of its value.

a) **Show** that a possible formula to model the value after x years is — 3 marks

$$P(x) = 100\,000 \cdot \mathrm{e}^{\ln(0.8)\cdot x}$$

b) **Calculate** the value of the machine at the start of 2024. — 2 marks

Exercise 5 Calc. : ✗



The graph shown above is of a sine function, $f(x)$, defined by:

$$f(x) = a\sin(b(x-c)) + d$$

Based on the information in the graph:

a) **Find** the period P and **hence** the value of b.	1.5 marks
b) **Find** the amplitude of the function and **hence** the value of a.	1.5 marks
c) **State** the coordinates of the point A and **hence** find the values of c and d.	2 marks

Exercise 6 Calc. : ✗

Given $f(x) = -x^2 + 2x + 3$:

a) **Find** an expression for the derivative $f'(x)$.	2.5 marks
b) **Find** an equation for the tangent to the graph of $y = f(x)$ at the point where $x = 2$.	2.5 marks

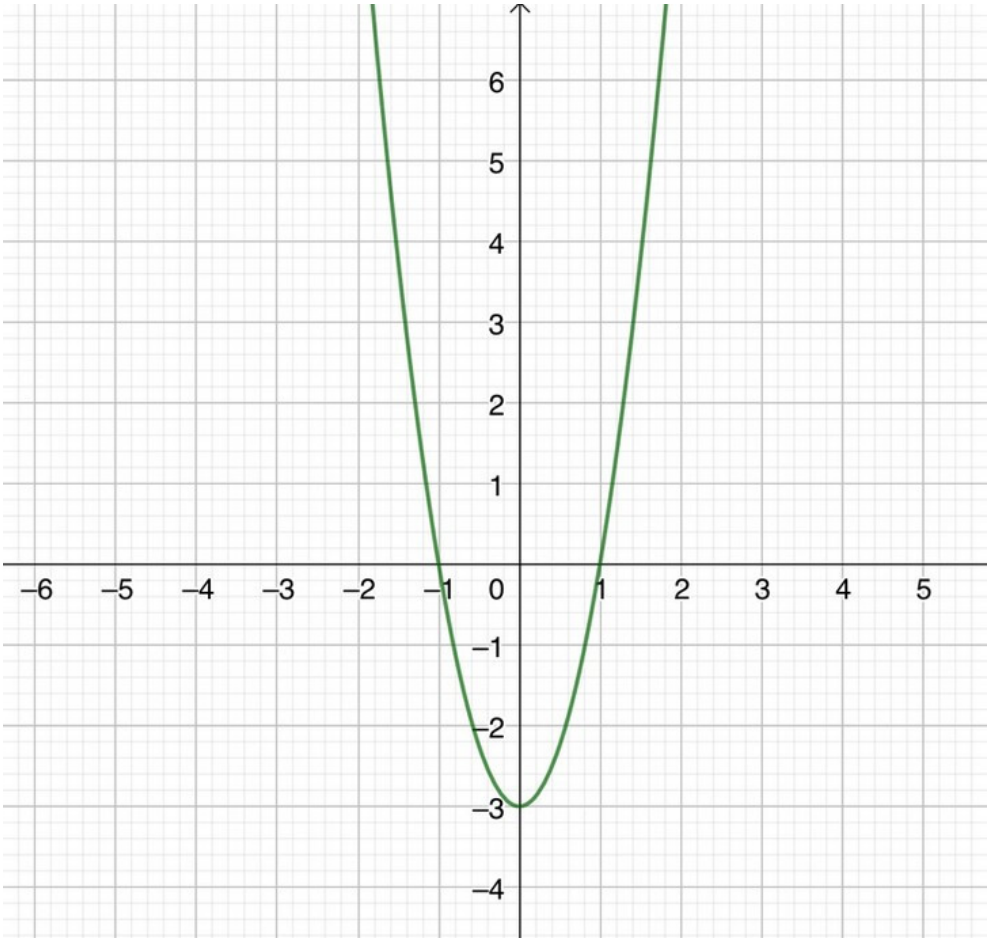
Exercise 7 Calc. : ✗

The height of a tree in cm is given by the function $h(t)$, where t is the number of weeks since it was planted.
Give an interpretation concerning the growth of the tree for each of the following:

a) $h(3) = 80$.	2 marks
b) $h'(2) = 4$.	1.5 marks
c) The value of t when $h'(t) = 0$.	1.5 marks

Exercise 8 Calc. : ✗

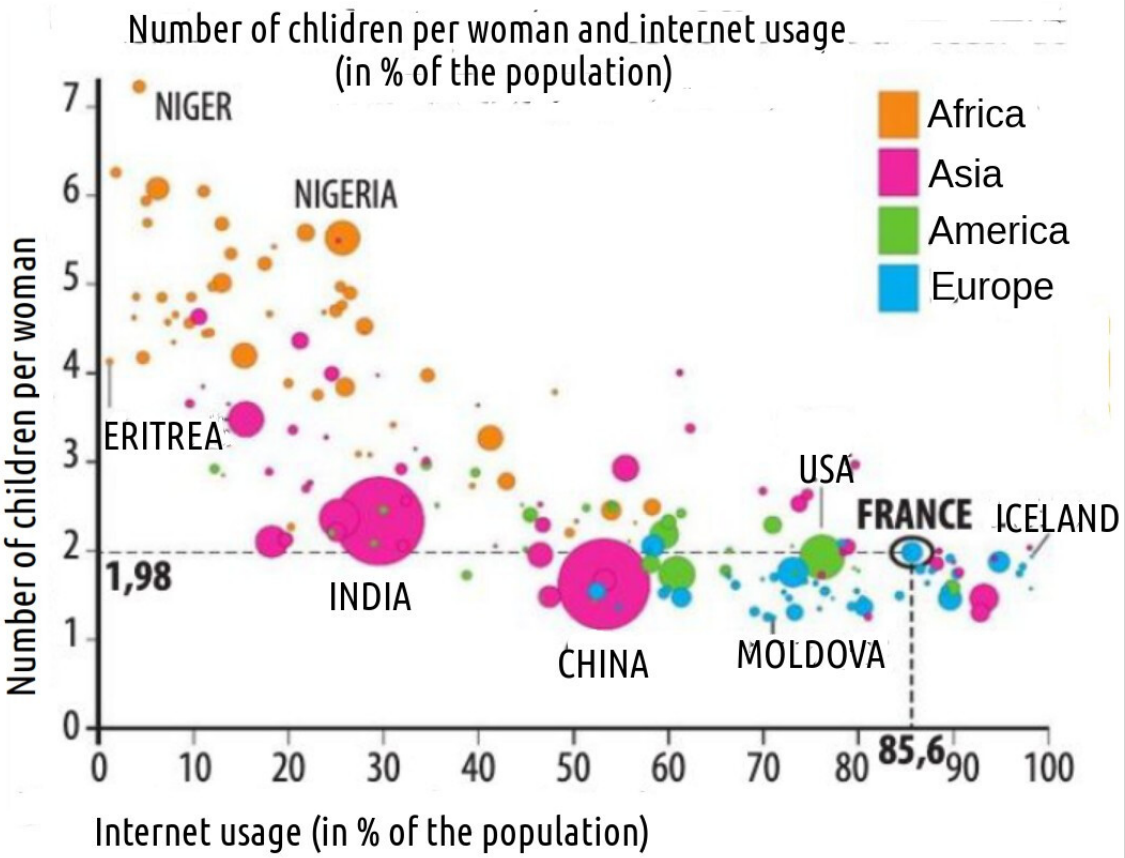
The graph represents the derivative of a function f



a) **Determine** how the sign of the derivative depends on the value of x. 2.5 marks

b) **Hence describe** how the graph of function f varies in gradient. 2.5 marks

Exercise 9 Calc. : ✗



a) **State** the variables of this graph. 1 mark

b) **Identify** the way in which the variables are correlated in the graph. 2 marks

c) **Explain** any causality that there might be between the variables. 2 marks

Exercise 10 Calc. : ✗

A statistical study of two numerical variables produces the scatter diagram on the right.

a) **Show by calculation** that the coordinates of the mean point are $(4, 6)$. 1 mark

$y = \frac{5}{4}x + 1$ is chosen as a regression line for the data.

b) **Show by calculation** that the mean point lies on this line. 1 mark

c) **Calculate** the value of y corresponding to $x = 2$. 1.5 marks

d) We can establish from the line that a value of $y = 38.5$ corresponds to a value of $x = 30$.

Comment on the whether such an extrapolation is reasonable. 1.5 marks