Exercise 1   Calc. : ✗
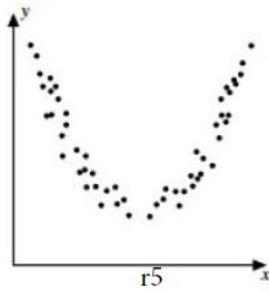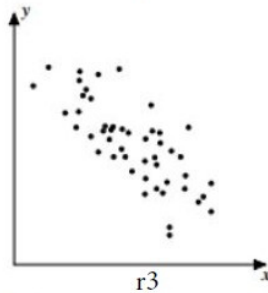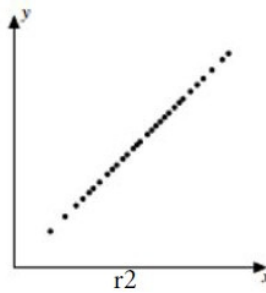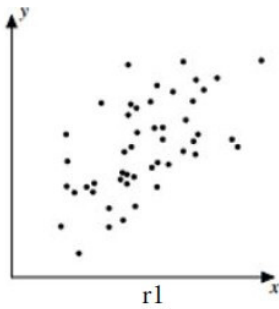
Arrange, by increasing order of size, the linear correlation coefficients, $r1$, $r2$, $r3$, $r4$, and $r5$, seen in these scatter diagrams.   5 marks
Give reasons for the order you have identified.
Note that the axes of all the diagrams are to the same scale.

r1

r2

r3

r4

r5

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   5 marks
that they do not belong to the reading club.

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 $y = f(x)$.
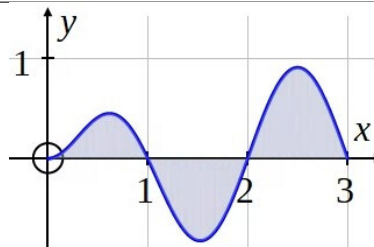
a) **Identify** which two of the following integrals would correctly calculate the area of steel   2.5 marks
   required.

1. $\displaystyle\int_0^1 f(x)\,dx + \int_1^2 f(x)\,dx + \int_2^3 f(x)\,dx$

2. $\displaystyle\int_0^3 f(x)\,dx$

3. $\displaystyle\int_0^3 |f(x)|\,dx$

4. $\displaystyle\int_0^1 f(x)\,dx - \int_1^2 f(x)\,dx + \int_2^3 f(x)\,dx$

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.

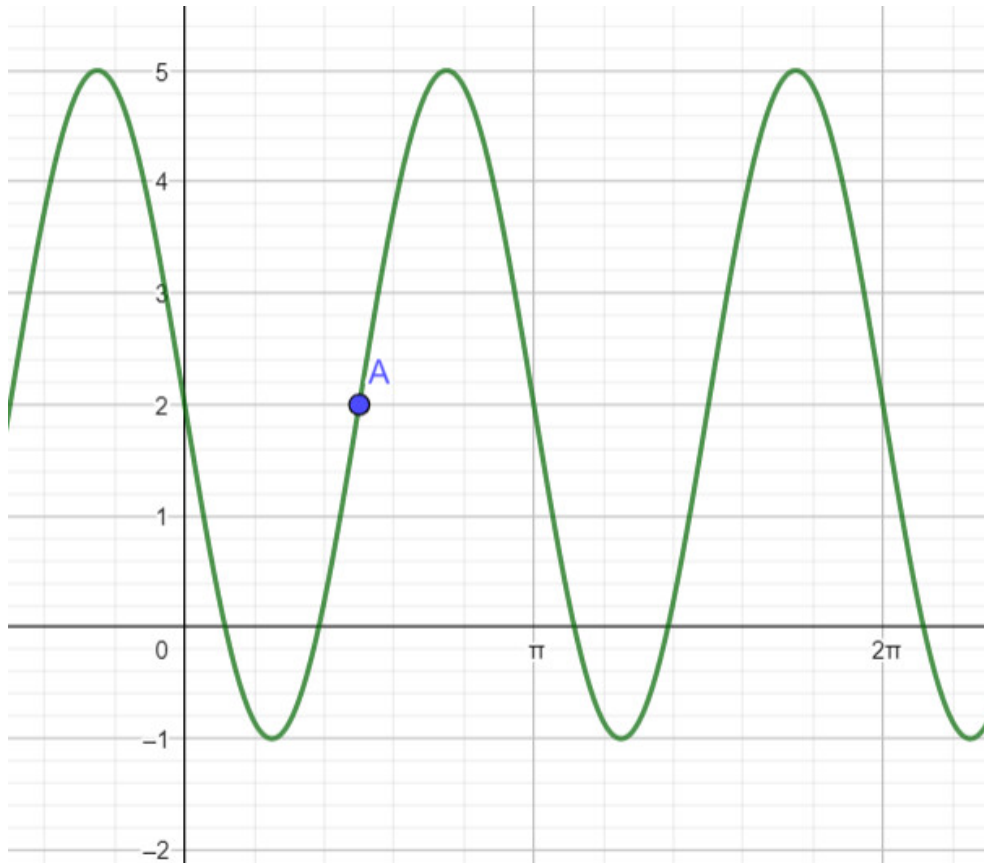a) **Show** that a possible formula to model the value after x years is   3 marks

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

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

Exercise 5

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

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

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

The graph represents the derivative of a function f
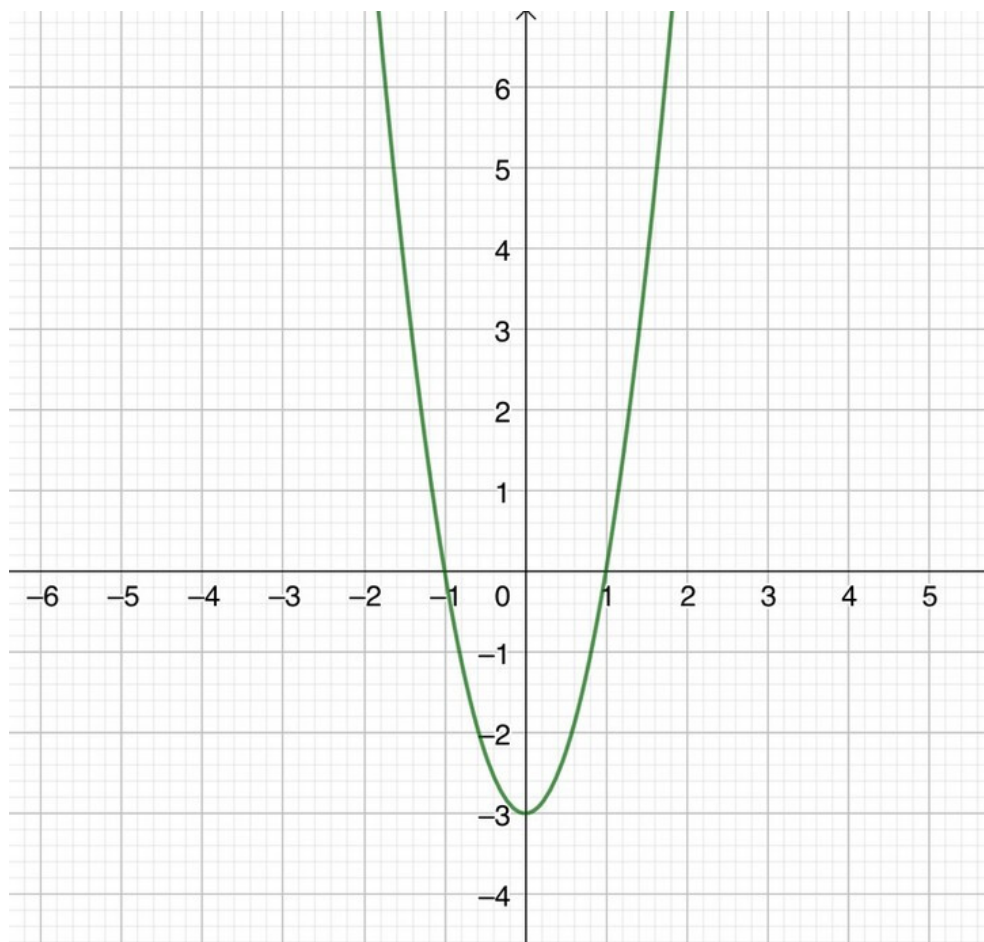
a) **Determine** how the sign of the derivative depends on the value of x.   2.5 marks

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

Number of chlidren per woman and internet usage
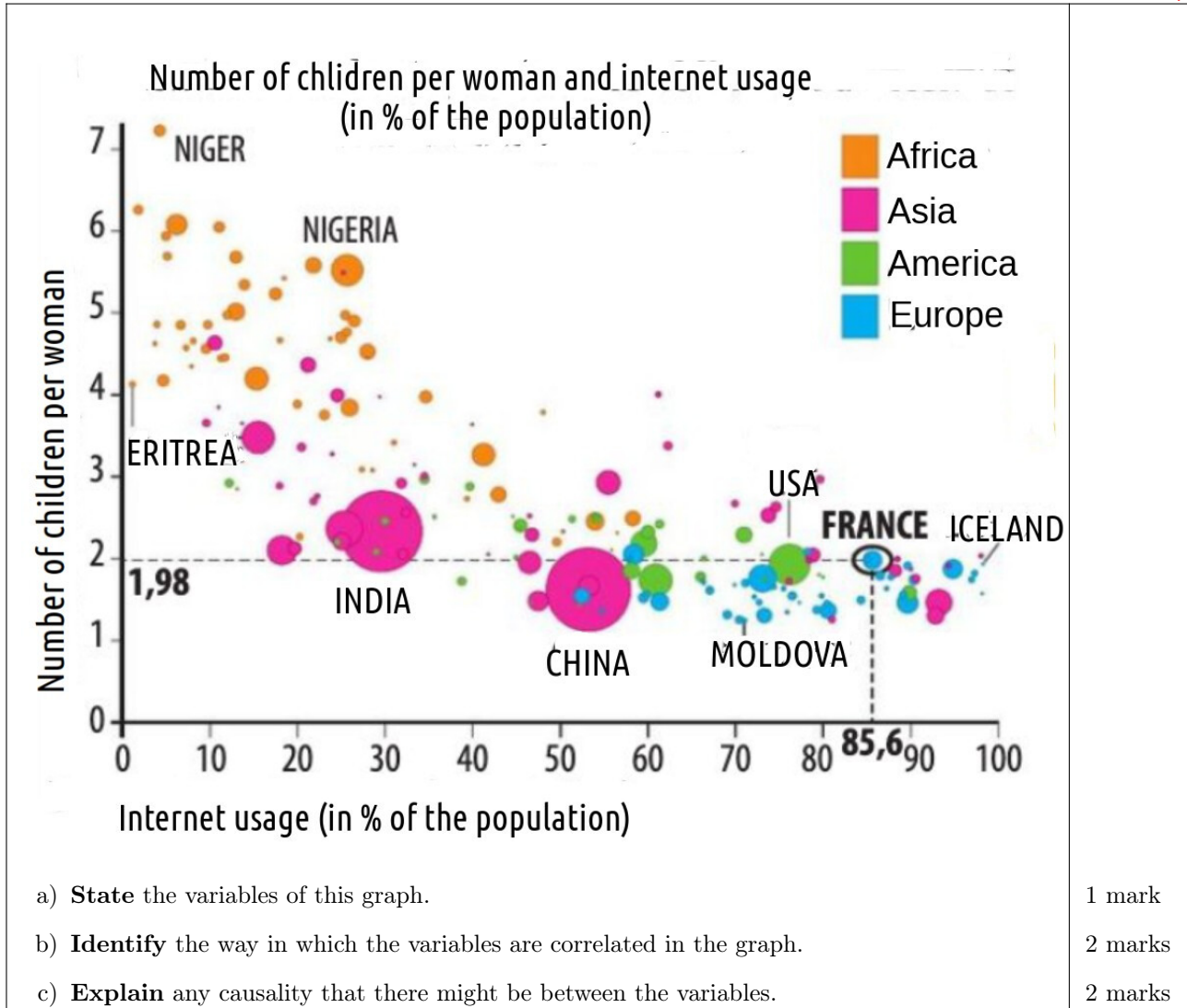(in % of the population)

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

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

$y = \dfrac{5}{4}x + 1$ 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