

Please check the examination details below before entering your candidate information

Candidate surname

Other names

Centre Number

Candidate Number

--	--	--	--	--

--	--	--	--	--

Pearson Edexcel International GCSE

Tuesday 20 May 2025

Afternoon (Time: 2 hours)

Paper
reference

4PM1/01

Further Pure Mathematics

PAPER 1



Calculators may be used.

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Without sufficient working, correct answers may be awarded no marks.
- Answer the questions in the spaces provided
– *there may be more space than you need.*
- You must **NOT** write anything on the formulae page.
Anything you write on the formulae page will gain NO credit.

Information

- The total mark for this paper is 100.
- The marks for **each** question are shown in brackets
– *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Check your answers if you have time at the end.

Turn over ►

P72865A

©2025 Pearson Education Ltd.
Y:1/1/1/1/1/



International GCSE in Further Pure Mathematics Formulae sheet

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Mensuration

Surface area of sphere = $4\pi r^2$

Curved surface area of cone = $\pi r \times$ slant height

Volume of sphere = $\frac{4}{3}\pi r^3$

Series

Arithmetic series

Sum to n terms, $S_n = \frac{n}{2}[2a + (n - 1)d]$

Geometric series

Sum to n terms, $S_n = \frac{a(1 - r^n)}{(1 - r)}$

Sum to infinity, $S_\infty = \frac{a}{1 - r} \quad |r| < 1$

Binomial series

$(1 + x)^n = 1 + nx + \frac{n(n - 1)}{2!}x^2 + \dots + \frac{n(n - 1)\dots(n - r + 1)}{r!}x^r + \dots \quad \text{for } |x| < 1, n \in \mathbb{Q}$

Calculus

Quotient rule (differentiation)

$$\frac{d}{dx} \left(\frac{f(x)}{g(x)} \right) = \frac{f'(x)g(x) - f(x)g'(x)}{[g(x)]^2}$$

Trigonometry

Cosine rule

In triangle ABC : $a^2 = b^2 + c^2 - 2bc \cos A$

$$\tan \theta = \frac{\sin \theta}{\cos \theta}$$

$$\sin(A + B) = \sin A \cos B + \cos A \sin B$$

$$\sin(A - B) = \sin A \cos B - \cos A \sin B$$

$$\cos(A + B) = \cos A \cos B - \sin A \sin B$$

$$\cos(A - B) = \cos A \cos B + \sin A \sin B$$

$$\tan(A + B) = \frac{\tan A + \tan B}{1 - \tan A \tan B}$$

$$\tan(A - B) = \frac{\tan A - \tan B}{1 + \tan A \tan B}$$

Logarithms

$$\log_a x = \frac{\log_b x}{\log_b a}$$



There are no questions on this page.

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



P 7 2 8 6 5 A 0 3 3 6

Question 1 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Handwriting practice area with 25 horizontal dotted lines.

(Total for Question 1 is 7 marks)



Question 2 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Handwriting practice area with 25 horizontal dotted lines.



Question 2 continued

Area with horizontal dotted lines for writing.

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



Question 2 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Area with horizontal dotted lines for writing.

(Total for Question 2 is 13 marks)



Question 3 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

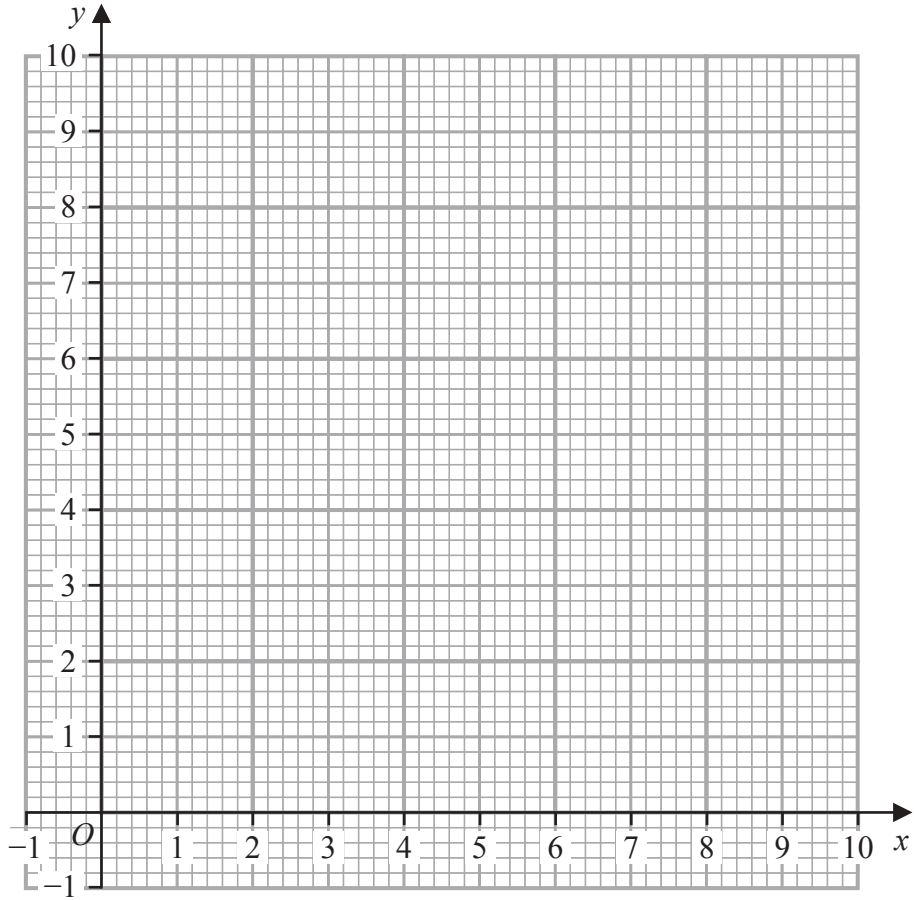
DO NOT WRITE IN THIS AREA

Area with horizontal dotted lines for writing.

(Total for Question 3 is 6 marks)



Question 4 continued



DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

Turn over for a spare grid if you need to redraw your graph.



Question 4 continued

Area with horizontal dotted lines for writing.

DO NOT WRITE IN THIS AREA

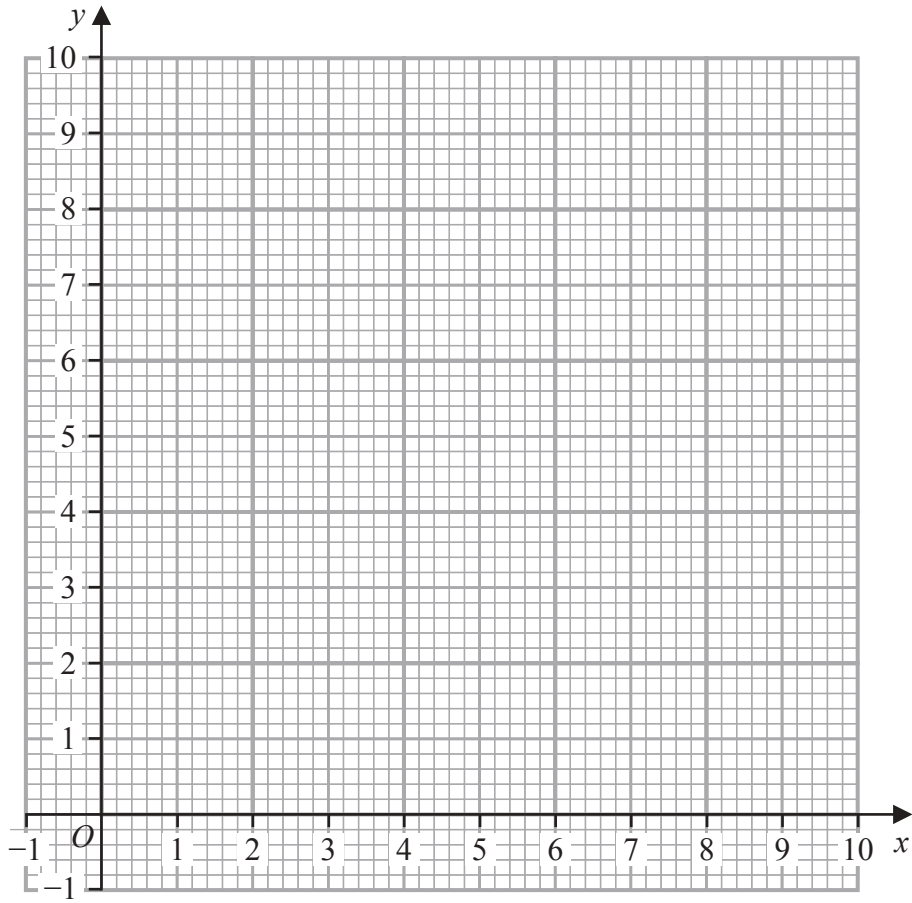
DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



Question 4 continued

Only use this grid if you need to redraw your graph.



.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(Total for Question 4 is 8 marks)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



Question 5 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Area with horizontal dotted lines for writing.

(Total for Question 5 is 8 marks)



Question 6 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Area with horizontal dotted lines for writing.

(Total for Question 6 is 8 marks)



P 7 2 8 6 5 A 0 1 9 3 6

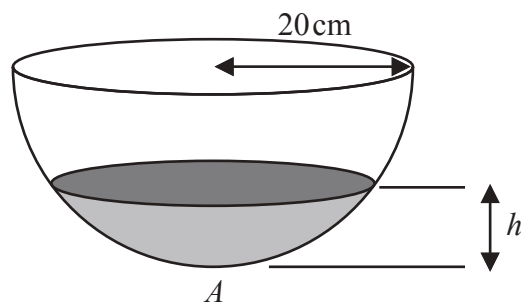


Diagram **NOT**
accurately drawn

Figure 2

Figure 2 shows a hollow hemisphere with radius 20 cm

The hemisphere contains liquid, which is dripping out of a small hole at the lowest point A at a constant rate of $k \text{ cm}^3/\text{s}$

At time t seconds after the liquid starts to drip from the hemisphere, the height of the liquid is h cm above A

The volume $V \text{ cm}^3$ of liquid in the hemisphere is given by

$$V = \frac{\pi}{3} h^2 (60 - h)$$

When $h = 12$, the height of the liquid is decreasing at a rate of $\frac{1}{60} \text{ cm/s}$

Find the value of k

Give your answer in terms of π

(6)



Question 7 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Handwriting practice area with 25 horizontal dotted lines.



P 7 2 8 6 5 A 0 2 1 3 6

Question 7 continued

Area with horizontal dotted lines for writing.

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



Question 7 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Area with horizontal dotted lines for writing.

(Total for Question 7 is 6 marks)



P 7 2 8 6 5 A 0 2 3 3 6

Question 8 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Area with horizontal dotted lines for writing.



P 7 2 8 6 5 A 0 2 5 3 6

Question 8 continued

Area with horizontal dotted lines for writing.

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



Question 8 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Area with horizontal dotted lines for writing.

(Total for Question 8 is 13 marks)



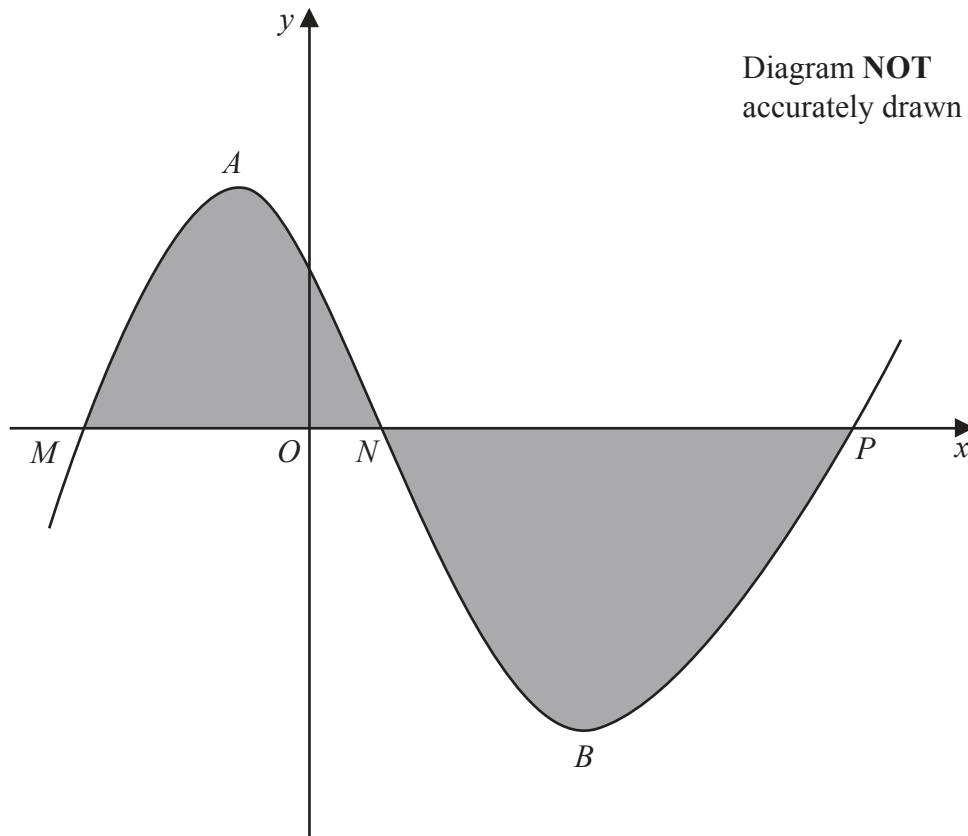


Figure 4

Figure 4 shows a sketch of part of the curve C with equation $y = f(x)$ where

$$f(x) = 2x^3 + ax^2 + bx + c$$

The curve C has a maximum at the point A with coordinates $\left(-\frac{1}{3}, \frac{100}{27}\right)$ and a minimum at the point B with coordinates $(2, -9)$

Given that a , b and c are integers

(a) show that $a = -5$, $b = -4$ and $c = 3$ (5)

(b) (i) Show that $(x+1)$ is a factor of $f(x)$ (1)

(ii) Hence, or otherwise, use algebra to factorise $f(x)$ completely. (3)

The curve C crosses the x -axis at the points M , N and P
The finite regions shown shaded in Figure 4 are bounded by the curve C and parts of the x -axis from M to N and from N to P

(c) Use algebraic integration to determine the total area of the shaded regions.
Give your answer as an exact fraction. (4)



Question 9 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Handwriting practice area with 25 horizontal dotted lines.



Question 9 continued

Area with horizontal dotted lines for writing.

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



Question 9 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Area with horizontal dotted lines for writing.

(Total for Question 9 is 13 marks)



P 7 2 8 6 5 A 0 3 1 3 6

Question 10 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Area with horizontal dotted lines for writing.

(Total for Question 10 is 11 marks)



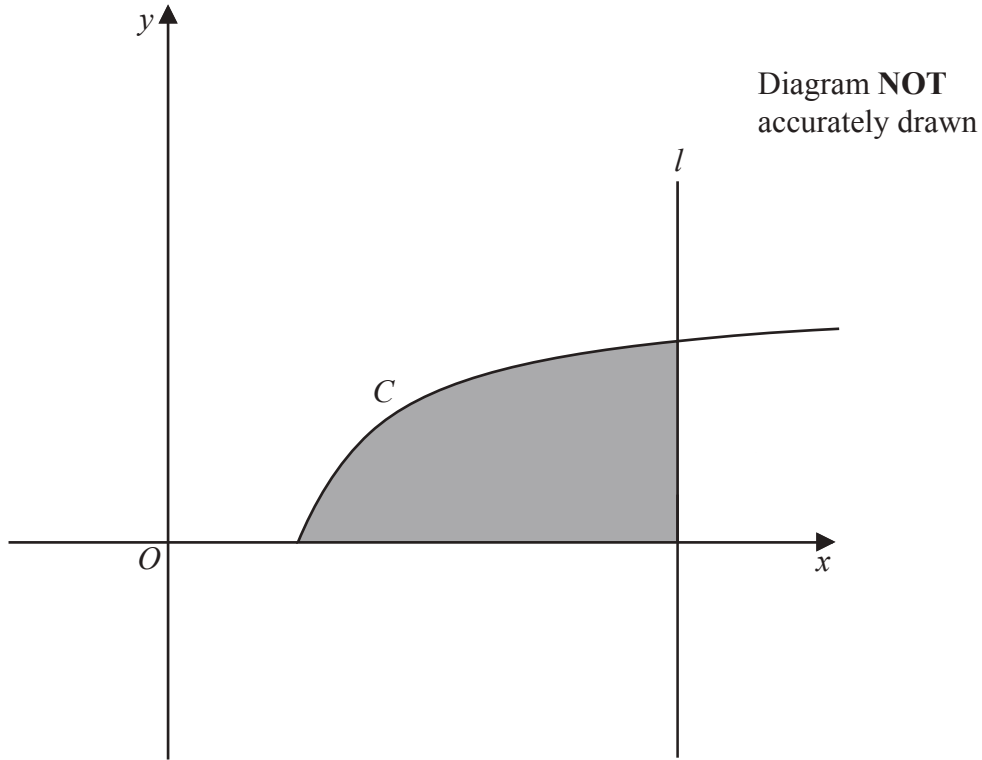


Figure 5

Figure 5 shows part of the curve C with equation $y = \sqrt{4x - 8}$ and the line l with equation $x = b$ where $b > 0$

The finite region bounded by the curve C , the x -axis and the line l , shown shaded in Figure 5, is rotated through 360° about the x -axis.

Given that the volume of the solid formed is 50π units³

find the value of b

(7)

.....

.....

.....

.....

.....

.....

.....

.....

DO NOT WRITE IN THIS AREA



Question 11 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Handwriting practice area with 25 horizontal dotted lines.



P 7 2 8 6 5 A 0 3 5 3 6

