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MATHEMATICS

9709/23

Paper 2 Pure Mathematics 2

May/June 2026

1 hour 15 minutes

You must answer on the question paper.

You will need: List of formulae (MF19)

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen. Do **not** use correction fluid or tape.
- Do **not** write on any bar codes.
- If additional space is needed, you should use the lined page at the end of this booklet; the question number or numbers must be clearly shown.
- You should use a calculator where appropriate.
- You must show all necessary working clearly; no marks will be given for unsupported answers from a calculator.
- Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place for angles in degrees, unless a different level of accuracy is specified in the question.

INFORMATION

- The total mark for this paper is 50.
- The number of marks for each question or part question is shown in brackets [].

This document has **16** pages. Any blank pages are indicated.





- 1 Find $\int_a^{2a} (1 + e^{-x})^2 dx$. Give your answer in terms of the positive constant a . [4]

[illegible]



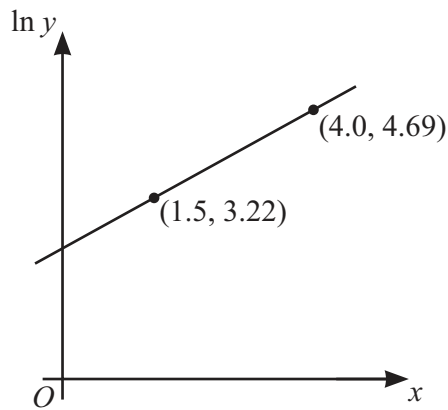
2 Solve the equation $3 \operatorname{cosec}^2 \theta = 7 + \cot^2 \theta$ for $-180^\circ < \theta < 180^\circ$.

[4]

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3



The variables x and y satisfy the equation $y = ka^{x+2}$, where k and a are positive constants. The graph of $\ln y$ against x is a straight line passing through the points $(1.5, 3.22)$ and $(4.0, 4.69)$, as shown in the diagram.

Find the values of k and a correct to 2 significant figures.

[5]

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- 4** A curve has equation $y = \frac{e^{2x}}{e^x + 2}$. The curve crosses the y -axis at the point P .

Find an equation of the normal to the curve at P . Give your answer in the form $ax + by + c = 0$, where a , b and c are integers. [6]

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- 5 (a) Solve the inequality $|4x - 7| \leq |2x + 3|$.

[4]

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- (b) Hence, find the smallest and largest integers, N , that satisfy the inequality

$$\left| 4 \ln\left(\frac{1}{2}N\right) - 7 \right| \leq \left| 2 \ln\left(\frac{1}{2}N\right) + 3 \right|. \quad [3]$$

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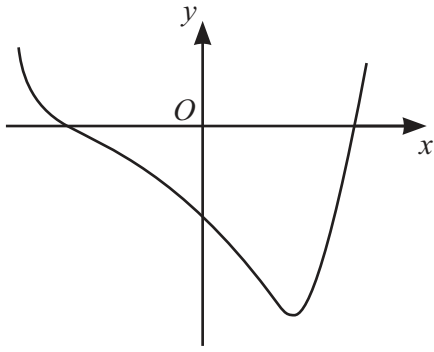
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The diagram shows the curve with equation $y = f(x)$, where

$$f(x) = ax^4 + 4x^3 - 3ax^2 - 21x - 18$$

and a is a constant. It is given that $(x + 2)$ is a factor of $f(x)$.

(a) Find the value of a .

[2]

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(b) Show that the positive root of the equation $f(x) = 0$ satisfies the equation

$$x = \sqrt[3]{3x + 4.5}.$$

[3]

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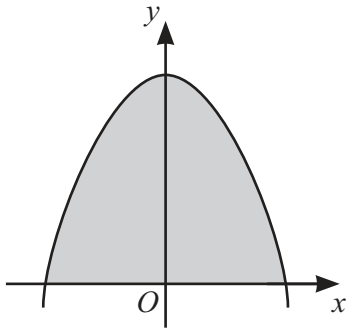
- (c) Use an iterative formula based on the equation $x = \sqrt[3]{3x+4.5}$ to find the positive root of the equation $f(x) = 0$ correct to 4 significant figures. Give the result of each iteration to 6 significant figures.

[3]





7



The diagram shows part of the curve with equation $y = 8 \cos 2x - \frac{1}{\cos^2 2x}$. The shaded region is bounded by the curve and the x -axis.

Find the exact area of the shaded region.

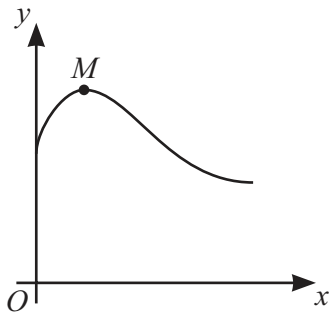
[7]

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[Turn over



The diagram shows the curve with parametric equations

$$x = 6t - \sin 2t, \quad y = 3 \cos 2t + 5 \sin t,$$

for $0 \leq t < \frac{1}{2}\pi$. The curve has a maximum point, M .

- (a)** Find the gradient of the curve at the point for which $t = 0$.

[4]

[illegible]



[5]

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Additional page

If you use the following page to complete the answer to any question, the question number must be clearly shown.

[illegible]





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