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CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

7521580043

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.

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

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2 Solve the equation $3\,\text{cosec}^2\theta = 7 + \cot^2\theta$ for $-180° < \theta < 180°$. [4]

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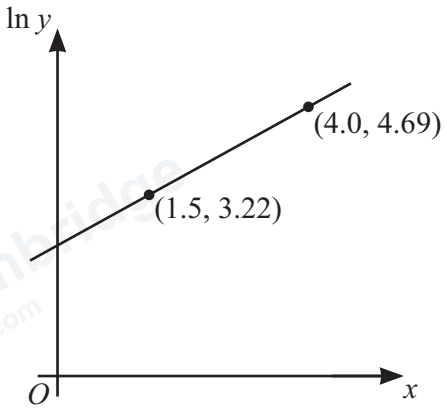

The variables x and y satisfy the equation $y = ka^{x+2}$, where k and a are positive constants. The graph of $\ln y$ against x is a straight line passing through the points (1.5, 3.22) and (4.0, 4.69), as shown in the diagram.

Find the values of k and a correct to 2 significant figures. [5]

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4 A curve has equation $y = \dfrac{e^{2x}}{e^{x}+2}$. 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 $|4x-7| \leqslant |2x+3|$. [4]

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

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

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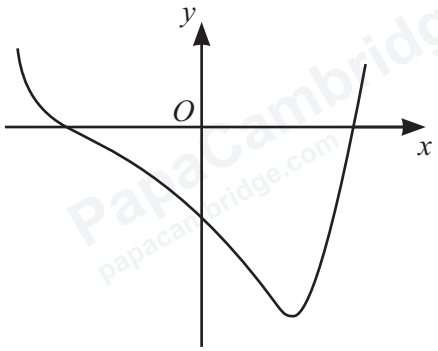

The diagram shows the curve with equation $y = \mathrm{f}(x)$, where

$$\mathrm{f}(x) = ax^4 + 4x^3 - 3ax^2 - 21x - 18$$

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

(a) Find the value of a. [2]

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(b) Show that the positive root of the equation $\mathrm{f}(x) = 0$ 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]

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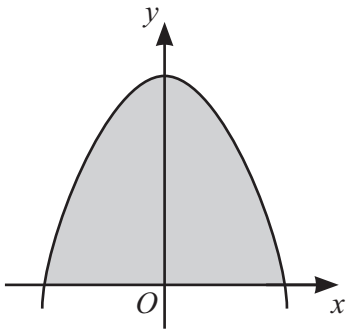

The diagram shows part of the curve with equation $y = 8\cos 2x - \frac{1}{\cos^2 2x}$. The shaded region is bounded by the curve and the x-axis.

Find the exact area of the shaded region. [7]

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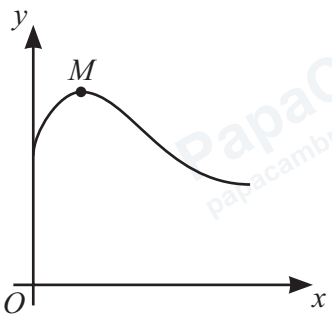

The diagram shows the curve with parametric equations

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

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

(a) Find the gradient of the curve at the point for which $t = 0$. [4]

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(b) Find the exact y-coordinate of M. [5]

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