Cambridge Assessment International Education

Cambridge International AS & A Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

MATHEMATICS **9709/23**

Paper 2 Pure Mathematics 2 **May/June 2025**

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 or correction fluid.
- 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.

[Turn over

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1 Show that $\int_2^{11} \frac{8}{4x+1}\,\mathrm{d}x = \ln a$, where a is an integer to be found. [3]

2 **(a)** Sketch on the same diagram the graphs of $y = |2x - 9|$ and $y = 4x - 5$. [2]

(b) Solve the inequality $|2x - 9| < 4x - 5$. [3]

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3 Find the coordinates of the stationary points of the curve with equation $y = \frac{8x}{2x+3} - 6x + 5$. [5]

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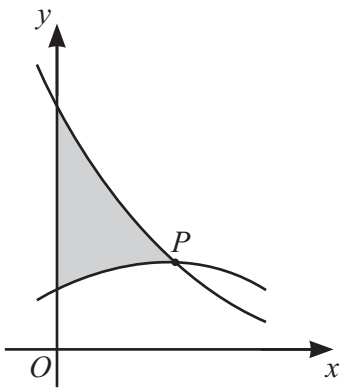

The diagram shows parts of the curves with equations $y = 4e^{-2x}$ and $y = 1 + 0.5\sin 3x$. Point P is a point of intersection of the curves, and the shaded region is bounded by the two curves and the y-axis.

(a) Show that the x-coordinate of P satisfies the equation $x = -0.5\ln(0.25 + 0.125\sin 3x)$. [1]

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(b) Use an iterative formula, based on the equation in part **(a)**, to find the x-coordinate of P correct to 4 significant figures. Use an initial value of 0.5 and give the result of each iteration to 6 significant figures. [3]

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(c) Hence find the area of the shaded region. Give your answer correct to 2 significant figures. [4]

5 The polynomial $\mathrm{p}(x)$ is defined by

$$\mathrm{p}(x) = ax^4 + bx^3 + 13x^2 - 35x + 15,$$

where a and b are constants. It is given that $(2x-1)$ and $(x-3)$ are factors of $\mathrm{p}(x)$.

(a) Find the values of a and b. [4]

(b) Hence factorise $\mathrm{p}(x)$. [3]

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(c) Find the least positive value of θ in radians such that $\mathrm{p}(\cot 2\theta) = 0$. [2]

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6 A curve has equation $(x^2 - 3)\ln y + 6x = 14$.

(a) Show that there is no point on the curve at which the y-coordinate is e^{-1}. [3]

(b) Find the equation of the tangent to the curve at the point $(2, e^2)$. Give your answer in the form $y = mx + c$, where m and c are exact constants. [6]

7 **(a)** Express $4\cos\theta\sin(\theta+30°)$ in the form $R\cos(2\theta-\alpha)+k$, where $R>0$, $0°<\alpha<90°$ and k is a constant. [6]

(b) Hence solve the equation

$$12\cos 2\phi \sin(2\phi + 30°) = 5$$

for $0° < \phi < 90°$. [5]

Additional page

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

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