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Cambridge Assessment International Education

Cambridge International AS & A Level

CANDIDATE NAME

CENTRE NUMBER

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MATHEMATICS **9709/23**

Paper 2 Pure Mathematics 2 **October/November 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.

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1 Find $\int 6\sin^2 x \, dx$. [3]

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2 Solve the equation $e^{2x}\left(e^{2x}-8\right)=48$. [3]

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3 **(a)** Solve the equation $|2x-3| = |5x+2|$. [3]

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(b) Hence solve the equation $|2\sec\theta - 3| = |5\sec\theta + 2|$ for $\pi < \theta < 2\pi$. Give your answer correct to 3 significant figures. [3]

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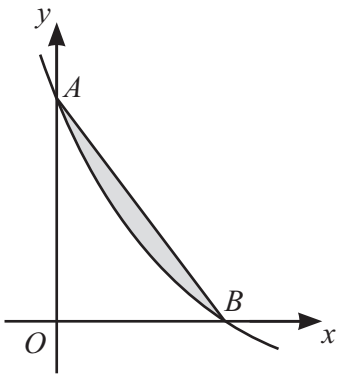
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4 Solve the equation $\cot\theta\tan(\theta+45°) = 7$ for $0° < \theta < 90°$. [5]

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The diagram shows the curve with equation $y = 8e^{-\frac{1}{2}x} - 1$. The curve meets the axes at the points A and B. The shaded region is bounded by the curve and the line segment AB.

(a) Show that the x-coordinate of B is $6\ln 2$. [2]

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(b) Find the area of the shaded region. Give your answer in the form $p\ln 2 - q$, where p and q are positive integers. [5]

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6 A curve has parametric equations

$$x = \tan\theta, \quad y = \sin\theta - 2\sin^3\theta,$$

for $0 < \theta < \frac{1}{2}\pi$.

(a) Show that $\frac{\mathrm{d}y}{\mathrm{d}x} = 6\cos^5\theta - 5\cos^3\theta$. [4]

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(b) Find the equation of the normal to the curve at the point where it crosses the x-axis. Give your answer in the form $y = mx + c$, where m and c are exact constants. [5]

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

$$\mathrm{p}(x) = 2x^4 + kx^3 + kx^2 + 17x + 18,$$

where k is a constant. It is given that $(x+2)$ is a factor of $\mathrm{p}(x)$.

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

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It is given that the equation $\mathrm{p}(x) = 0$ has exactly two real roots, denoted by α and β, where α is an integer and β is not an integer.

(b) State the value of α and show that β satisfies the equation $x = \sqrt[3]{-2x - 4.5}$. [4]

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(c) Show by calculation that $-1.4 < \beta < -1.0$. [2]

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(d) Use an iterative formula, based on the equation in part **(b)**, to find the value of β correct to 3 significant figures. Give the result of each iteration to 5 significant figures. [3]

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8 The equation of a curve is $y = 4e^{1-2x}\sqrt{3x-1}$.

Find the exact coordinates of the stationary point of the curve. [6]

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