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CAMBRIDGE
International Education

Cambridge International AS & A Level

MATHEMATICS **9709/32**

Paper 3 Pure Mathematics 3 **May/June 2026**

1 hour 50 minutes

You must answer on the answer booklet.

You will need: Answer booklet
List of formulae (MF19)

INSTRUCTIONS

- Answer **all** questions.
- Write your answers on the answer booklet. Follow the instructions on the front cover of the answer booklet. If you need additional answer paper, ask the invigilator for a continuation booklet.
- 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 75.
- The number of marks for each question or part question is shown in brackets [ ].

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1 Find the quotient and remainder when $4x^3 - 4x^2 + 7x + 2$ is divided by $2x - 1$. [3]

2 Solve the equation $2^{5-2x} = \frac{4^{x+1}}{3}$. Give your answer in the form $\frac{\ln a}{\ln b}$, where a and b are integers. [4]

3 The complex numbers s and t are given by

$$s = 3(\cos 2 + \mathrm{i}\sin 2) \qquad \text{and} \qquad t = 2\mathrm{e}^{-\mathrm{i}}.$$

(a) Express st in the form $r\mathrm{e}^{\mathrm{i}\theta}$, where $-\pi < \theta \leqslant \pi$ and $r > 0$. [2]

(b) In an Argand diagram with origin O, the points A and B represent the complex numbers s and st respectively.

By considering the line segments OA and OB, or otherwise, state the two geometric effects on OA of multiplying s by t. [2]

4 The square roots of $3 - \left(6\sqrt{2}\right)\mathrm{i}$ can be expressed in the Cartesian form $x + \mathrm{i}y$, where x and y are real and exact.

By first forming a quartic equation, find the square roots of $3 - \left(6\sqrt{2}\right)\mathrm{i}$. Give your answer in exact Cartesian form. [5]

5 The parametric equations of a curve are

$$x = 2\theta - \tan 2\theta, \qquad y = 6\theta + 2\ln(\cos 2\theta),$$

for $0 \leqslant \theta \leqslant \frac{1}{4}\pi$.

(a) Find an expression for $\frac{\mathrm{d}y}{\mathrm{d}x}$ in terms of $\tan 2\theta$. [6]

(b) Find the exact coordinates of the point on the curve at which the gradient of the tangent is equal to -1. [4]

6 The equation of a curve is $y = x\tan^{-1}3x$ for $-\pi \leqslant x \leqslant \pi$.

(a) Find the exact value of the gradient of the curve when $x = \frac{1}{3}$. [4]

(b) Find the exact value of $\int_0^{\frac{1}{3}} y\,\mathrm{d}x$. [6]

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7 The equation of a curve is

$$y = \frac{3 + \sin 3x}{2 - \cos 3x}$$

for $0 \leqslant x \leqslant \pi$. The gradient of the curve is equal to $-\frac{3}{2}$ when $x = a$.

(a) Show that a satisfies the equation $\sin^2 3a + 6\sin 3a - 3 = 0$. [4]

(b) Hence find the values of a for $0 \leqslant a \leqslant \pi$. [3]

8 **(a)** By sketching a suitable pair of graphs, show that the equation $\operatorname{cosec} \frac{1}{2}x = \frac{1}{2}(x+3)$ has exactly one root in the interval $0 \leqslant x \leqslant \pi$. [2]

(b) Show by calculation that this root lies between 1 and 1.2. [2]

(c) Show that, if a sequence of real values given by the iterative formula

$$x_{n+1} = 2\sin^{-1}\left(\frac{2}{x_n + 3}\right)$$

converges, then it converges to the root of the equation in **8(a)**. [2]

(d) Use the iterative formula in **8(c)** to calculate this root correct to 3 decimal places. Give the result of each iteration to 5 decimal places. [3]

9 The points A and B have position vectors $\begin{pmatrix} 3 \\ 4 \\ 1 \end{pmatrix}$ and $\begin{pmatrix} 4 \\ 3 \\ 1 \end{pmatrix}$ respectively.

The line m passes through the points A and B.

(a) Find a vector equation for m. [2]

The line l has equation $\mathbf{r} = \begin{pmatrix} 6 \\ -1 \\ -3 \end{pmatrix} + \mu \begin{pmatrix} 1 \\ -1 \\ -2 \end{pmatrix}$.

(b) Determine whether the lines l and m are parallel, intersect or are skew. [4]

(c) The point P lies on l and is such that angle $PAB = 60°$.

Find the position vector of P. [6]

Question 10 is on the back page.

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10 **(a)** Express $\dfrac{x+3}{(x-1)(2x-6)}$ in partial fractions. [4]

(b) The variables x and y satisfy the differential equation

$$(x-1)(2x-6)\frac{\mathrm{d}y}{\mathrm{d}x} = \frac{x+3}{\ln(2y)}.$$

It is given that $y = 1$ when $x = 4$.

Solve the differential equation to obtain an equation in x and y. [7]

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