



Cambridge International AS & A Level

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MATHEMATICS

9709/33

Paper 3 Pure Mathematics 3

May/June 2026

1 hour 50 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 75.
- The number of marks for each question or part question is shown in brackets [].

This document has **20** pages. Any blank pages are indicated.



- 1 Solve the equation $\ln 5 + \ln(3x - 2) = 2 \ln(x - 4)$. Give your answer in a simplified exact form. [4]

[illegible]



[4]

[illegible]

- 3 On an Argand diagram, shade the region which represents the complex numbers, z , satisfying the inequalities $|z - 2 + i| \leq 3$ and $|z| \geq |z - 2 + 2i|$.

[5]





4 Solve the equation $\cos(2\theta - 45^\circ) + \sin(2\theta - 45^\circ) + 1 = 0$ for $-180^\circ \leq \theta \leq 180^\circ$.

[6]

[illegible]



5 (a) The parametric equations of a curve are

$$x = \tan 2t, \quad y = \frac{1}{\sin 2t}.$$

Show that $\frac{dy}{dx}$ can be written as $\frac{A \cos 2t}{\tan^2 2t}$, where A is a constant to be found. [5]

[illegible]



(b) Find an exact equation of the tangent to the curve at the point where $t = \frac{1}{8}\pi$.

[4]

[illegible]



6 Use the substitution $u = \sqrt{x}$ to find the exact value of $\int_{\frac{1}{16}\pi^2}^{\frac{1}{4}\pi^2} \frac{\cos(3\sqrt{x})}{\sqrt{x}} dx$. [6]

[illegible]



- 7 The square roots of $3 - (20\sqrt{7})i$ can be expressed in the Cartesian form $x + iy$, where x and y are real and exact.

By first forming a quartic equation, find the square roots of $3 - (20\sqrt{7})i$. Give your answer in exact Cartesian form. [5]

[illegible]

- 8 (a) By sketching a suitable pair of graphs, show that the equation $x^3 = 4 - 2x$ has exactly one real root.

[1]

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

$$x_{n+1} = \frac{3x_n^3 + 4}{4x_n^2 + 2}$$

converges, then it converges to the root of the equation in 8(a).

[2]

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(c) Show by calculation that this root lies between 1 and 2.

[2]

[illegible]

(d) Use the iterative formula given in 8(b) to calculate this root correct to 2 decimal places. Give the result of each iteration to 5 decimal places. [3]

[3]

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[5]

[illegible]



- (b) Hence, obtain the expansion of $f(x)$ in ascending powers of x , up to and including the term in x^3 .
[4]

[illegible]

- (c) State the set of values of x for which the expansion is valid. [1]

[illegible]



10 The variables x and y satisfy the differential equation

$$4e^{2x} \frac{dy}{dx} = x(y+3)$$

for $y > -3$. It is given that $y = -2$ when $x = 0$.

Solve the differential equation and obtain an expression for y in terms of x .

[8]

[illegible]



15

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- 11 The points A and B have position vectors $\begin{pmatrix} 4 \\ -1 \\ 2 \end{pmatrix}$ and $\begin{pmatrix} -1 \\ -3 \\ 5 \end{pmatrix}$ respectively. The line t passes through the points A and B .

(a) Find a vector equation for t .

[2]

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The line s has equation $\mathbf{r} = \begin{pmatrix} 2 \\ 1 \\ 5 \end{pmatrix} + \mu \begin{pmatrix} -3 \\ -4 \\ 5 \end{pmatrix}$.

(b) Find the acute angle between s and t .

[3]

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(c) Find the length of the perpendicular from A to s .

[5]

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

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