



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]

This image shows a full page of white paper with horizontal dotted lines, typical of primary school writing paper. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

- 2** Find the set of values of x satisfying the inequality $|3^{2x-1} - 4| > 2$. Give your answers correct to 3 significant figures. [4]

This image shows a full page of white paper with horizontal dotted lines. The lines are evenly spaced and run across the width of the page, providing a guide for handwriting practice. There are no margins, text, or other markings on the page.

- 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]

This image shows a full page of white paper with horizontal dashed lines, typical of primary school writing paper. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

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]



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

[4]

This image shows a full page of white paper with horizontal dashed lines, typical of primary school handwriting practice paper. The lines are evenly spaced and run across the entire width of the page. There are no margins, text, or other markings present.



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]

[5]

This image shows a full page of primary-ruled paper. It features approximately 20 horizontal dotted lines spaced evenly down the page, providing a guide for handwriting practice. The paper is otherwise blank, with no margins, text, or other markings.

- 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]

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(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]

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9 Let $f(x) = \frac{36 - 4x - 3x^2}{(3x + 1)(x^2 + 4)}$.

(a) Express $f(x)$ in partial fractions.

[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]

This image shows a full page of white paper with horizontal dashed lines, typical of primary-ruled notebook paper. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

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

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

[illegible]

- 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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