



Cambridge International AS & A Level

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MATHEMATICS**9709/33**

Paper 3 Pure Mathematics 3

October/November 2025**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 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 75.
- The number of marks for each question or part question is shown in brackets [].

This document has **20** pages.



[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.



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

[3]

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

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.

- 4 On an Argand diagram shade the region whose points represent complex numbers z which satisfy both the inequalities $|z + 2i| \leq 3$ and $|z + 2i| \leq |z - 2 + 4i|$. [5]





5 (a) Show that $\cos 4x + 2 \sin^2 x - 1 \equiv 8 \sin^4 x - 6 \sin^2 x$.

[4]

[illegible]



(b) Hence solve the equation $\cos 4x + 2 \sin^2 x - 1 = 0$ for $-180^\circ \leq x \leq 180^\circ$.

[4]

[illegible]



6 Find the exact value of $\int_0^{\frac{1}{6}\pi} x^2 \sin 2x \, dx$.

[6]

[illegible]

[illegible]



- 7 Solve the equation $\frac{5z}{2-i} - zz^* + 20 + 8i = 0$. Give your answers in the form $x + iy$, where x and y are real. [6]

This image shows a full page of white paper with horizontal dotted lines, typical of primary school handwriting practice 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.



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8 The curve with equation $y = e^{-5x} \ln 5x$ has a stationary point at $x = p$.

(a) Show that p satisfies the equation $\ln 5p = \frac{1}{5p}$. [3]

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(b) By sketching a suitable pair of graphs, show that the equation in part (a) has only one root. [2]





(c) Show by calculation that $0.2 < p < 0.6$.

[2]

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(d) It is given that the equation in part (a) can be written in the form $p = \frac{1}{5} \exp\left(\frac{1}{5p}\right)$, where $\exp(x)$ denotes e^x .

Use an iterative formula based on this rearrangement to calculate p correct to 2 decimal places.
Give the result of each iteration to 4 decimal places. [3]

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- 9** The line l_1 passes through the point $(3, 1, -6)$ and is parallel to the vector $2\mathbf{i} + \mathbf{j} + 4\mathbf{k}$.

The line l_2 passes through the point $(-1, 3, -6)$ and is perpendicular to the vector $3\mathbf{i} - 2\mathbf{j} + \mathbf{k}$. The direction vector for l_2 has no component in the x -direction.

- (a) Write down a vector equation for l_1 and find a vector equation for l_2 . [3]

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

- (b)** Calculate the acute angle between l_1 and l_2 . [3]

[illegible]



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(c) Find the position vector of the point of intersection of l_1 and l_2 . [3]

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- 10 (a) Express $\frac{2}{1-9y^2}$ in partial fractions.

[2]

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

$$2 \cos^2 3x \frac{dy}{dx} = 1 - 9y^2,$$

and $y = 0$ when $x = \frac{1}{12}\pi$.

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

[6]

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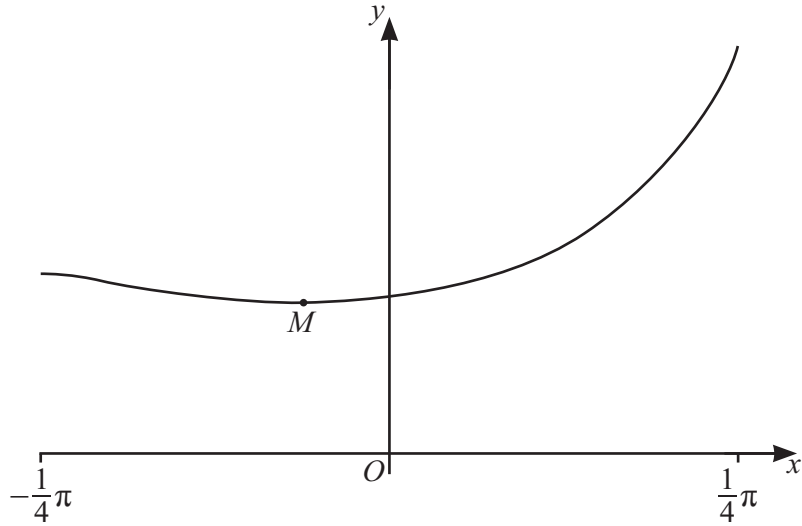
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[illegible]



The diagram shows the graph of $y = \sec^2 x \sqrt{3 + 2 \tan x}$ for $-\frac{1}{4}\pi \leq x \leq \frac{1}{4}\pi$, and its minimum point M .

- (a) Find the x -coordinate of M .

[6]

[illegible]



- (b) Using the substitution $u = 3 + 2 \tan x$, find the exact value of the area of the region bounded by the curve, the x -axis and the lines $x = -\frac{1}{4}\pi$ and $x = \frac{1}{4}\pi$. [6]





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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