



Cambridge International AS & A Level

CANDIDATE
NAMECENTRE
NUMBER

--	--	--	--	--

CANDIDATE
NUMBER

--	--	--	--

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

[3]

[illegible]



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 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.

- 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]

This image shows a full page of a handwriting practice worksheet. It consists of approximately 20 horizontal rows. Each row is defined by two parallel dotted lines, creating a series of uniform gaps for writing. The lines are evenly spaced across the entire page, providing a guide for letter height and placement. There is no text or other markings on the page.



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

[6]

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.



This image shows a full page of a handwriting practice worksheet. It consists of approximately 20 horizontal rows. Each row is defined by two parallel dotted lines, creating a series of uniform gaps for letter height. The entire page is otherwise blank, with no margins, text, or other markings.





- 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]

[illegible]



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.



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]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(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]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(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]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....





- 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]

This image shows a blank sheet of white paper with ten horizontal dashed lines, typical of primary-ruled notebook paper. The lines are evenly spaced and extend across the width of the page. There is no handwriting or other markings on the paper.



DO NOT WRITE IN THIS MARGIN

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

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

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....



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

[2]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

- (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]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

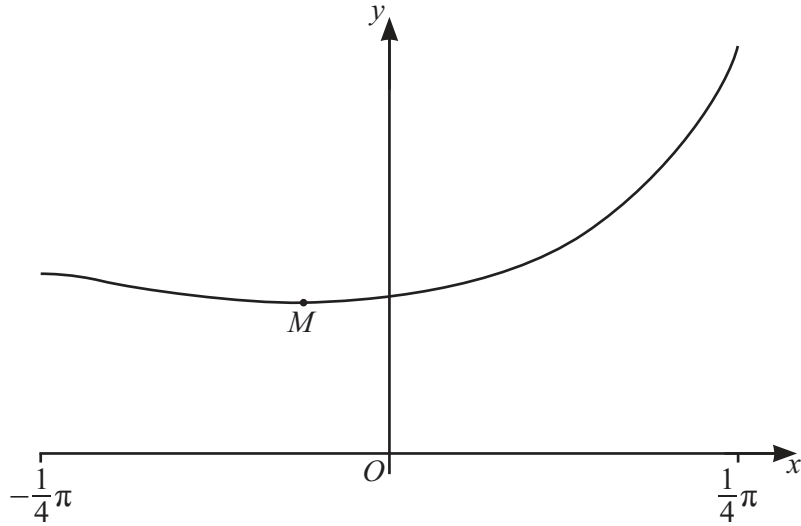
.....





17





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.

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.

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced online in the Cambridge Assessment International Education Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download at www.cambridgeinternational.org after the live examination series.

Cambridge Assessment International Education is part of Cambridge Assessment. Cambridge Assessment is the brand name of the University of Cambridge Local Examinations Syndicate (UCLES), which is a department of the University of Cambridge.

