



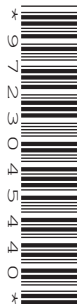
Cambridge International AS & A Level

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**MATHEMATICS****9709/33**

Paper 3 Pure Mathematics 3

May/June 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. Any blank pages are indicated.



1 (a) Sketch the graph of $y = |3x - 2a|$, where a is a positive constant.

[1]

(b) Hence or otherwise solve the inequality $|3x - 2a| < x + 5a$.

[3]

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3

2 Solve the equation $2 \ln(2x+3) - \ln(2x+5) = \ln(3x)$.

[4]

[illegible]



[4]

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- 4 (a) It is given that $z_1 = r_1 e^{i\theta_1}$ and $z_2 = r_2 e^{i\theta_2}$.

Show that $(z_1 z_2)^* = z_1^* z_2^*$. [3]

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- (b) $z = 3e^{\frac{1}{4}\pi i}$ is a root of the equation $z^2 + bz + c = 0$, where b and c are real.

State the other root and hence find the values of b and c . [3]

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- 6 Find the complex numbers z for which $\frac{z+4}{z+4i}$ is real and $|z| = \sqrt{10}$. Give your answers in the form $z = x + iy$, where x and y are real. [6]

[illegible]



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[3]

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- (b)** Hence obtain the expansion of $f(x)$ in ascending powers of x , up to and including the term in x^2 . [4]

[illegible]

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

[illegible]



[4]

[illegible]



(b) Hence solve the equation $\cot^2 x - \tan^2 x = 5 \sec 2x$ for $0^\circ < x < 90^\circ$.

[4]

[illegible]



- 9 With respect to the origin O , the points A , B and C have position vectors given by

$$\overrightarrow{OA} = \mathbf{i} + 2\mathbf{j}, \quad \overrightarrow{OB} = \mathbf{i} + 3\mathbf{j} - 2\mathbf{k} \quad \text{and} \quad \overrightarrow{OC} = 2\mathbf{i} - \mathbf{j} + 3\mathbf{k}.$$

The line l passes through B and C .

- (a) Find a vector equation for l .

[2]

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- (b) The point P is the foot of the perpendicular from A to l .

Find the position vector of P .

[4]

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- (c) The point D is the reflection of A in l .

Find the position vector of D .

[2]





(b) Given that $0 < y < \frac{1}{2}\pi$, find the values of y when $x = 0$.

[2]





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

$$x_{n+1} = \frac{1}{2} \left(\pi - \tan^{-1}(4x_n) \right)$$

converges, then it converges to a .

[2]

(d) Use the iterative formula in part (c) to calculate a correct to 4 decimal places. Give the result of each iteration to 6 decimal places. [3]





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

[illegible]

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