



Cambridge International AS & A Level

CANDIDATE NAME



CENTRE NUMBER

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MATHEMATICS

9709/32

Paper 3 Pure Mathematics 3

February/March 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.

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1 Solve the equation

$$\ln(1 - e^{-2x}) + 3 = 0.$$

Give your final answer correct to 4 decimal places.

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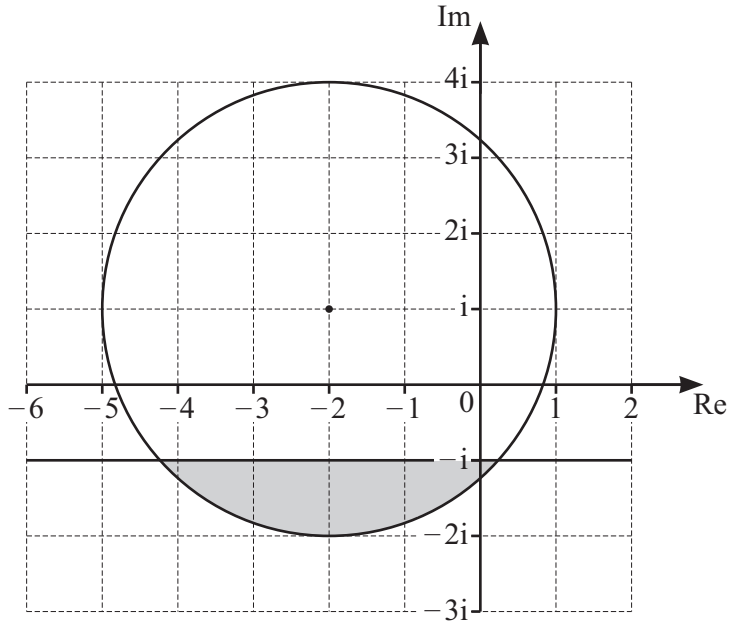


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The shaded region on the Argand diagram shows points representing complex numbers z defined by two inequalities. The shaded region is bounded by a circle and a line parallel to the real axis. The boundaries of the region are included in the shaded region.

(a) Find two inequalities in terms of z that define the shaded region. [3]

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(b) Find the greatest value of $|z|$ for points in this region. [3]

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5 The square roots of $-4+6\sqrt{5}i$ can be expressed in the Cartesian form $x+iy$, where x and y are real and exact.

By first forming a quartic equation in x or y , find the square roots of $-4+6\sqrt{5}i$ in exact Cartesian form. [5]

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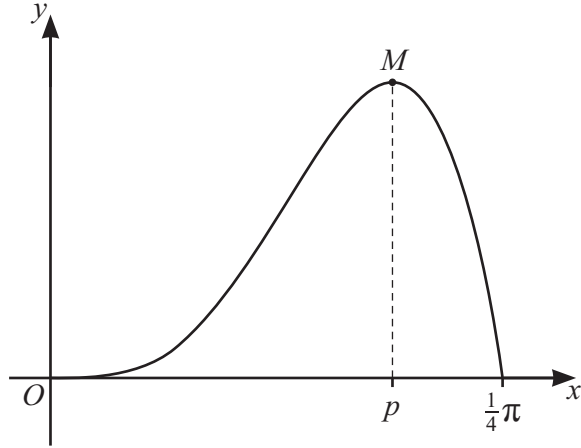
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The diagram shows the curve $y = x^3 \cos 2x$ for $0 \leq x \leq \frac{1}{4}\pi$. The curve has a maximum point at M , where $x = p$.

- (a) Show that p satisfies the equation $p = \frac{1}{2} \tan^{-1} \left(\frac{3}{2p} \right)$. [3]

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(b) Show by calculation that $0.5 < p < 0.7$.

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(c) Use an iterative formula based on the equation in part (a) to calculate p correct to 3 decimal places. Give the result of each iteration to 5 decimal places. [3]

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8 Two lines have equations $\mathbf{r} = \begin{pmatrix} -1 \\ 3 \\ -4 \end{pmatrix} + \lambda \begin{pmatrix} 2 \\ 3 \\ -1 \end{pmatrix}$ and $\mathbf{r} = \begin{pmatrix} 2 \\ -3 \\ -1 \end{pmatrix} + \mu \begin{pmatrix} -1 \\ -2 \\ 1 \end{pmatrix}$.

(a) Show that the lines are skew. [5]

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(b) Find the obtuse angle between the directions of the two lines.

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- 9 The polynomial $6x^3 + ax^2 + bx + 9$ is denoted by $p(x)$, where a and b are constants. It is given that $(x - 3)$ is a factor of $p(x)$, and when the first derivative $p'(x)$ is divided by $(x - 3)$ the remainder is 72.
- (a) Find the values of a and b . [5]

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(b) When a and b have the values found in part (a), factorise $p(x)$ completely.

[3]

Dotted lines for writing the answer to part (b).

(c) Hence solve the inequality $p(x) < 0$.

[2]

Dotted lines for writing the answer to part (c).

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10 Let $f(x) = \frac{-7x^2 + 2x - 6}{(1+x)(4+x^2)}$.

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

[5]

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(b) Hence find the exact value of $\int_0^2 f(x) dx$. Give your answer in the form $a\pi - \ln b$, where a and b are constants. [6]

Dotted lines for writing the answer.

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11 Find the exact value of $\int_0^\pi x^2 \cos \frac{1}{3}x dx$.

[6]

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Additional page

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