



Cambridge International AS & A Level

CANDIDATE
NAME



CENTRE
NUMBER

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CANDIDATE
NUMBER

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MATHEMATICS

9709/32

Paper 3 Pure Mathematics 3

October/November 2024

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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- 2 (a)** By sketching a suitable pair of graphs, show that the equation $\cot 2x = \sec x$ has exactly one root in the interval $0 < x < \frac{1}{2}\pi$. [2]

- (b)** Show that if a sequence of real values given by the iterative formula

$$x_{n+1} = \frac{1}{2} \tan^{-1}(\cos x_n)$$

converges, then it converges to the root in part **(a)**.

[1]

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. A faint, large watermark reading "KINDER" is visible in the top-left corner.



[3]

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- 5 (a) The complex number u is given by

$$u = \frac{(\cos \frac{1}{7}\pi + i \sin \frac{1}{7}\pi)^4}{\cos \frac{1}{7}\pi - i \sin \frac{1}{7}\pi}.$$

Find the exact value of $\arg u$.

[2]

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- (b) The complex numbers u and u^* are plotted on an Argand diagram.

Describe the single geometrical transformation that maps u onto u^* and state the exact value of $\arg u^*$.

[2]

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$$x = \tan^2 2t, \quad y = \cos 2t,$$

(a) Show that $\frac{dy}{dx} = -\frac{1}{2}\cos^3 2t$.

[4]

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(b) Hence find the equation of the normal to the curve at the point where $t = \frac{1}{8}\pi$. Give your answer in the form $y = mx + c$. [4]

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[5]



- (c) Using a scalar product, calculate angle ABC . [4]





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(a) Find $f'(x)$ and hence find the exact coordinates of the stationary point of the curve with equation $y = f(x)$. [5]

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5

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