



Cambridge International AS & A Level

CANDIDATE
NAME

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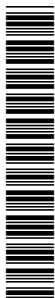
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NUMBER

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MATHEMATICS

9709/12

Paper 1 Pure Mathematics 1

October/November 2023

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.

3 The equation of a curve is such that $\frac{dy}{dx} = \frac{1}{2}x + \frac{72}{x^4}$. The curve passes through the point $P(2, 8)$.

(a) Find the equation of the normal to the curve at P . [2]

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(b) Find the equation of the curve. [4]

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6 The equation of a curve is $y = x^2 - 8x + 5$.

(a) Find the coordinates of the minimum point of the curve. [2]

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The curve is stretched by a factor of 2 parallel to the y -axis and then translated by $\begin{pmatrix} 4 \\ 1 \end{pmatrix}$.

(b) Find the coordinates of the minimum point of the transformed curve. [2]

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8 Functions f and g are defined by

$$f(x) = (x + a)^2 - a \text{ for } x \leq -a,$$
$$g(x) = 2x - 1 \text{ for } x \in \mathbb{R},$$

where a is a positive constant.

(a) Find an expression for $f^{-1}(x)$. [3]

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(b) (i) State the domain of the function f^{-1} . [1]

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(ii) State the range of the function f^{-1} . [1]

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(b) State the set of values for which the function f is increasing. [1]

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A circle passes through the points A , B and C .

(b) Find the equation of the circle. [3]

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(c) Find the equation of the tangent to the circle at C , giving the answer in the form $dx + ey + f = 0$, where d , e and f are integers. [3]

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