



Cambridge International AS & A Level

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MATHEMATICS

9709/22

Paper 2 Pure Mathematics 2

October/November 2024

1 hour 15 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 50.
- The number of marks for each question or part question is shown in brackets [].

This document has **16** pages. Any blank pages are indicated.



This image shows a full page of a handwriting practice worksheet. It consists of multiple sets of three horizontal dotted lines, providing a guide for letter height and placement. The lines are evenly spaced across the entire page, leaving ample room for writing practice. There is no text or other markings on the page.



2 Let $f(x) = 4 \sin^2 3x$.

(a) Find the value of $f'\left(\frac{1}{4}\pi\right)$. [3]

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(b) Find $\int f(x)dx$. [3]

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3 A curve has equation $6e^{-x}y^2 + e^{2x} - 12y + 7 = 0$.

Find the gradient of the curve at the point $(\ln 3, 2)$.

[6]

[illegible]



4 (a) Sketch the graphs of $y = 1 + e^{2x}$ and $y = |x - 4|$ on the same diagram. [2]

(b) The two graphs meet at the point P .

Show that the x -coordinate of P satisfies the equation $x = \frac{1}{2} \ln(3 - x)$. [2]

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[illegible]

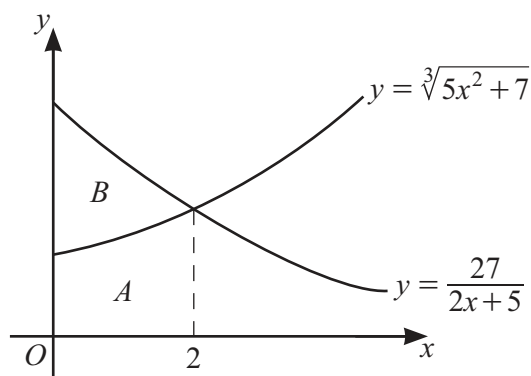
$$p(x) = ax^3 + bx^2 - ax + 8,$$

(a) Find the values of a and b . [4]

This image shows a full page of white paper with horizontal ruling lines. The lines are evenly spaced and extend across the width of the page, providing a template for handwriting practice or general writing. There are no margins, text, or other markings on the page.

[illegible]

This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and extend across the width of the page. There are no margins, text, or other markings on the paper.



The diagram shows the curves with equations $y = \sqrt[3]{5x^2 + 7}$ and $y = \frac{27}{2x+5}$ for $x \geq 0$.

The curves meet at the point $(2, 3)$.

Region A is bounded by the curve $y = \sqrt[3]{5x^2 + 7}$ and the straight lines $x = 0$, $x = 2$ and $y = 0$.

Region B is bounded by the two curves and the straight line $x = 0$.

- (a) Use the trapezium rule with two intervals to find an approximation to the area of region A . Give your answer correct to 3 significant figures. [3]

This image shows a full page of a handwriting practice worksheet. It consists of multiple sets of three horizontal dashed lines, providing a guide for letter height and placement. The lines are evenly spaced across the entire page, which is otherwise blank.



- (b) Find the exact total area of regions A and B . Give your answer in the form $k \ln m$, where k and m are constants. [3]

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- (c) Deduce an approximation to the area of region B . Give your answer correct to 3 significant figures. [1]

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- (d) State, with a reason, whether your answer to part (c) is an over-estimate or an under-estimate of the area of region B . [2]

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$$a + R \sin(2\theta - \alpha),$$

where a and R are positive integers and $0^\circ < \alpha < 90^\circ$. [6]

[illegible]



[illegible]



Additional page

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

Lined area for writing answers, consisting of multiple horizontal dotted lines.

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