



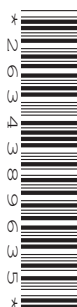
Cambridge International AS & A Level

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

Paper 3 Pure Mathematics 3

May/June 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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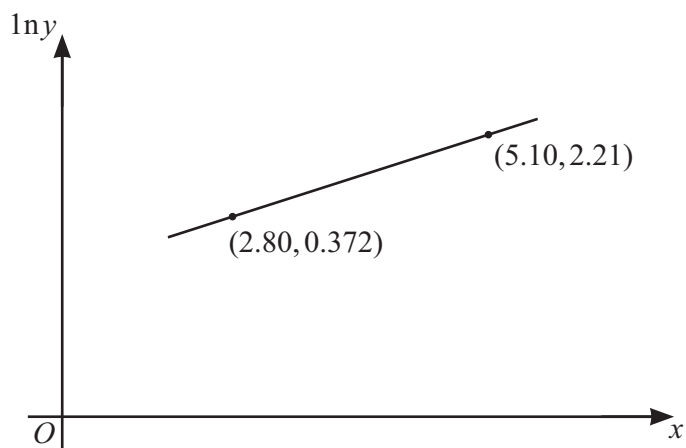
2 Find the exact coordinates of the stationary point of the curve $y = e^{2x} \sin 2x$ for $0 \leq x \leq \frac{1}{2}\pi$. [5]

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[illegible]



4



The variables x and y satisfy the equation $ky = e^{cx}$, where k and c are constants. The graph of $\ln y$ against x is a straight line passing through the points $(2.80, 0.372)$ and $(5.10, 2.21)$, as shown in the diagram.

Find the values of k and c . Give each value correct to 2 significant figures.

[4]

[illegible]

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(b) Calculate the greatest value of $\arg z$ for points in this region. [2]

[illegible]



7 Let $f(x) = 8x^3 + 54x^2 - 17x - 21$.

(a) Show that $x + 7$ is a factor of $f(x)$. [1]

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(b) Find the quotient when $f(x)$ is divided by $x + 7$. [2]

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for $0^\circ \leq \theta \leq 360^\circ$.

[3]

[illegible]

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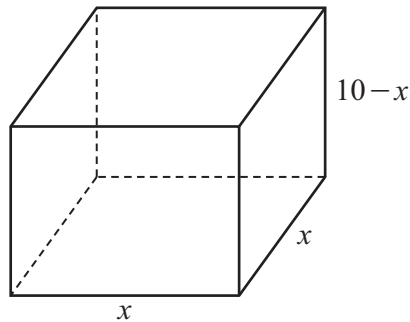
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A container in the shape of a cuboid has a square base of side x and a height of $(10-x)$. It is given that x varies with time, t , where $t > 0$. The container decreases in volume at a rate which is inversely proportional to t .

When $t = \frac{1}{10}$, $x = \frac{1}{2}$ and the rate of decrease of x is $\frac{20}{37}$.

- (a)** Show that x and t satisfy the differential equation

$$\frac{dx}{dt} = \frac{-1}{2t(20x - 3x^2)}. \quad [5]$$

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



[6]

[illegible]

$$\mathbf{r} = \mathbf{i} + \mathbf{j} + 2a\mathbf{k} + \lambda(3\mathbf{i} + 4\mathbf{j} + a\mathbf{k}) \quad \text{and} \quad \mathbf{r} = -3\mathbf{i} - \mathbf{j} + 4\mathbf{k} + \mu(-\mathbf{i} + 2\mathbf{j} + 2\mathbf{k}),$$

(a) Given that the acute angle between the directions of these lines is $\frac{1}{4}\pi$, find the possible values of a . [6]

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[illegible]

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[9]

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This image shows a full page of a worksheet designed for handwriting practice. It consists of approximately 20 horizontal rows. Each row is defined by two parallel dashed lines, creating a series of uniform gaps where letters can be written. The lines are evenly spaced across the entire page, providing a guide for letter height and placement. There is no text or other markings on the page.

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

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