



Cambridge International AS & A Level

CANDIDATE
NAME
CENTRE
NUMBER

--	--	--	--	--

CANDIDATE
NUMBER

--	--	--	--

MATHEMATICS

9709/33

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 [].

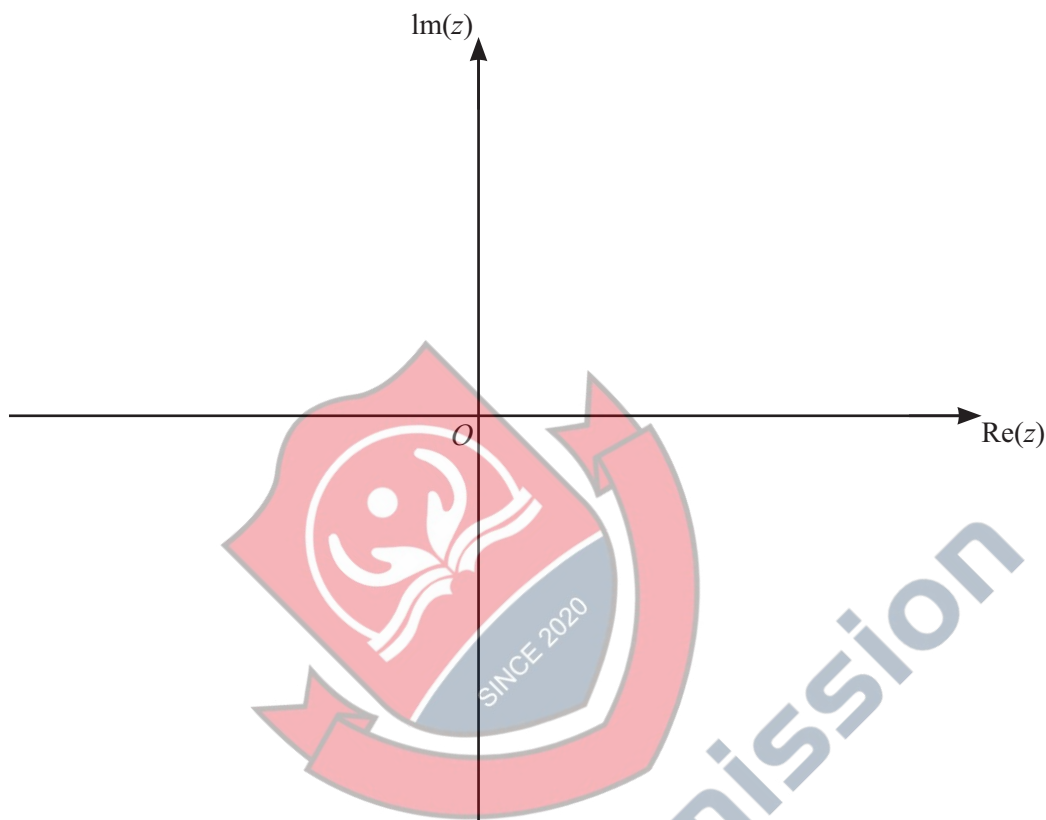
This document has **20** pages.



1 The complex number z satisfies $|z| = 2$ and $0 \leq \arg z \leq \frac{1}{4}\pi$.

(a) On the Argand diagram below, sketch the locus of the points representing z . [2]

(b) On the **same diagram**, sketch the locus of the points representing z^2 . [2]



2 Let $f(x) = 2x^3 - 5x^2 + 4$.

(a) Show that if a sequence of values given by the iterative formula

$$x_{n+1} = \sqrt{\frac{4}{5-2x_n}}$$

converges, then it converges to a root of the equation $f(x) = 0$.

[2]

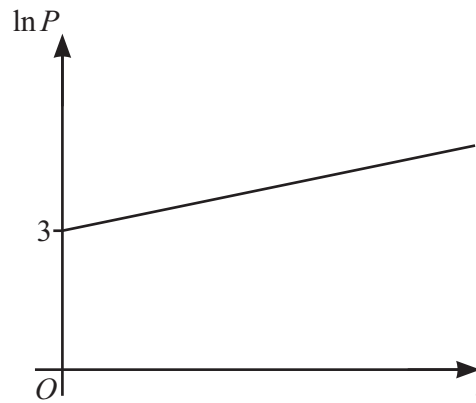
(b) The equation has a root close to 1.2 .

Use the iterative formula from part (a) and an initial value of 1.2 to determine the root correct to 2 decimal places. Give the result of each iteration to 4 decimal places.

[3]



3



The number of bacteria in a population, P , at time t hours is modelled by the equation $P = ae^{kt}$, where a and k are constants. The graph of $\ln P$ against t , shown in the diagram, has gradient $\frac{1}{20}$ and intersects the vertical axis at $(0, 3)$.

- (a) State the value of k and find the value of a correct to 2 significant figures. [3]

.....

.....

.....

.....

.....

.....

.....

- (b) Find the time taken for P to double. Give your answer correct to the nearest hour. [2]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....





Give your answer in the form $x + iy$, where x and y are real.

[5]



SINCE 2020

4Uadmission

The image features the logo of the University of Jeddah in the top left corner, which includes a red and white emblem with the text "SINCE 2020". A large, light blue watermark with the text "4Uadmission" is diagonally across the page. The background is white with horizontal dotted lines.

[3]



4Uadmission



[3]



4Uadmission

A large, light blue, diagonal watermark reading "4Uadmission" is overlaid across the entire page. In the top left corner, there is a partial view of a red and white circular logo with a shield in the center. The shield is divided into two sections: the top section is red with a white outline, and the bottom section is white with a red outline. The text "SINCE 2020" is written in red within the white section of the shield.

l: $\mathbf{r} = 2\mathbf{i} + \mathbf{j} - 3\mathbf{k} + \lambda(-\mathbf{i} + 2\mathbf{k})$ and *m*: $\mathbf{r} = 2\mathbf{i} + \mathbf{j} - 3\mathbf{k} + \mu(2\mathbf{i} - \mathbf{j} + 5\mathbf{k})$.

(a) State the coordinates of P .

[1]

[3]



- Find the exact area of triangle APB .



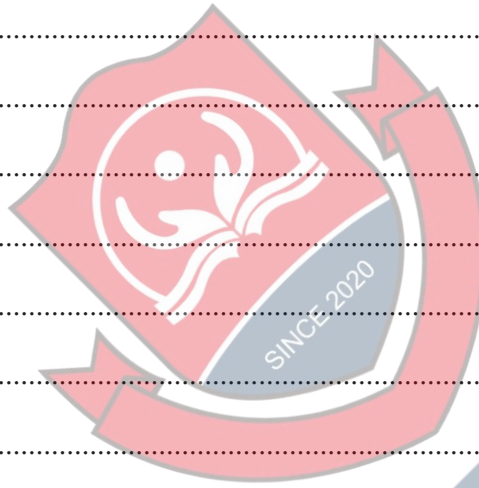
4Uadmission



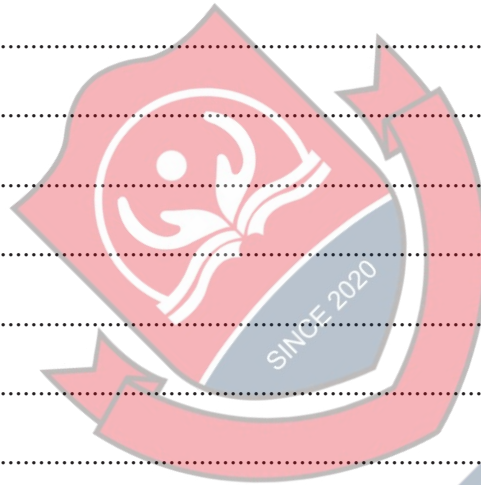
$$x = 3 \sin 2t, \quad y = \tan t + \cot t,$$

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

[5]





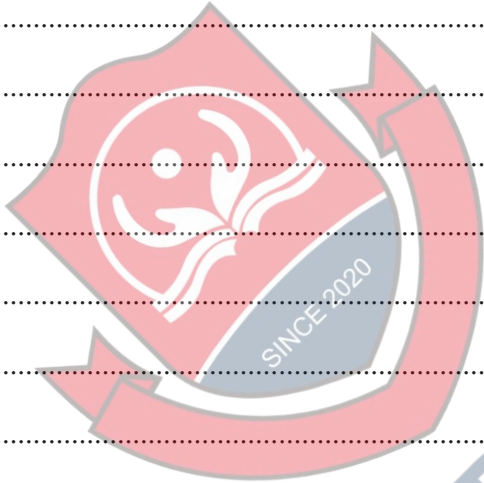


SINCE 2020

4Uadmission

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

[3]



4Uadmission

[illegible]



4Uadmission



[5]



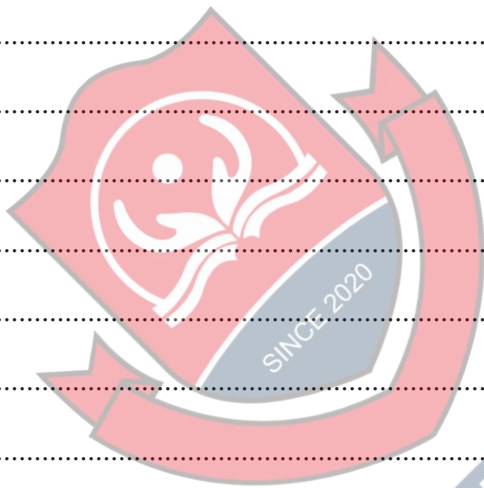
- (a) Show that $200 \frac{dh}{dt} = 250 - 3h$. [3]



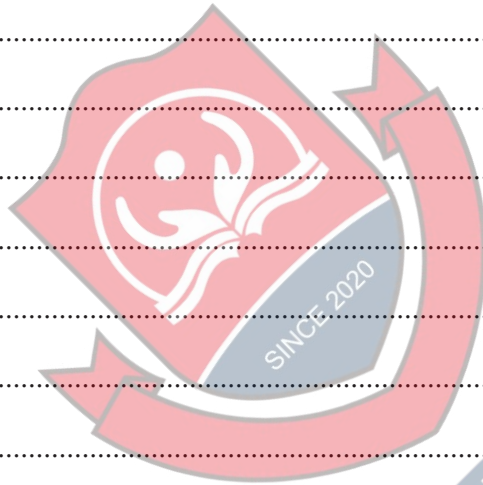
4Uadmission



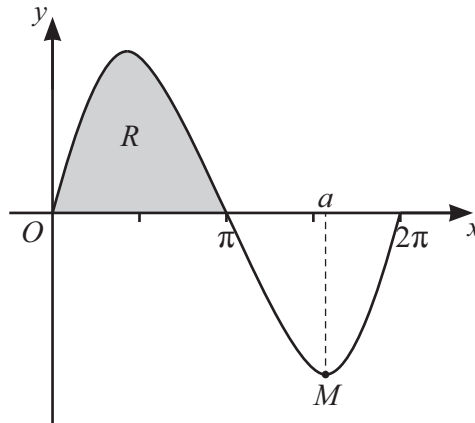
[5]



The logo is a red shield-shaped emblem. Inside the shield, there is a white stylized sun or flower-like symbol. Below this symbol, the text 'SINCE 2020' is written in white. A red banner or ribbon wraps around the bottom and sides of the shield. The entire logo is set against a background of horizontal dotted lines. A large, light blue watermark with the text '4Uadmission' is diagonally placed across the lower half of the page.



4Uadmission



- (a) Find the value of a correct to 2 decimal places.

[5]



[6]



4Uadmission

DO NOT WRITE IN THIS MARGIN

DO NOT WRITE IN THIS MARGIN

DO NOT WRITE IN THIS MARGIN

DO NOT WRITE IN THIS MARGIN

DO NOT WRITE IN THIS MARGIN