

[Turn over

- 1** It is given that $x = \ln(2y - 3) - \ln(y + 4)$.

Express y in terms of x .

[3]

This image shows a full page of white paper with horizontal dashed lines, typical of primary-ruled notebook paper. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

- 2 (a) On an Argand diagram, shade the region whose points represent complex numbers z satisfying the inequalities $-\frac{1}{3}\pi \leq \arg(z - 1 - 2i) \leq \frac{1}{3}\pi$ and $\operatorname{Re} z \leq 3$. [3]

- (b) Calculate the least value of $\arg z$ for points in the region from (a). Give your answer in radians correct to 3 decimal places. [2]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

- [5]

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

$$\frac{5z}{1+2i} - zz^* + 30 + 10i = 0,$$

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, typical of notebook or legal stationery. There are no margins, text, or other markings on the page.

$$x = te^{2t}, \quad y = t^2 + t + 3.$$

This image shows a single page 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.

This image shows a full page of white paper with horizontal dashed lines, typical of primary school handwriting practice paper. 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** (a) Express $5 \sin \theta + 12 \cos \theta$ in the form $R \cos(\theta - \alpha)$, where $R > 0$ and $0 < \alpha < \frac{1}{2}\pi$. [3]

[illegible]

[4]

[illegible]

A circle with center O . Two radii, OA and OB , are drawn, forming a sector. The angle at the center O is labeled $x \text{ rad}$. The region between the arc AB and the chord AB is shaded gray.

(a) Show that $x = \frac{3}{4} \sin x + \frac{1}{2} \pi$. [4]

This image shows a full page of white paper with horizontal dashed lines, typical of primary school writing paper. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

- (b) Show by calculation that the root of the equation in (a) lies between 2 and 2.5. [2]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

- (c) Use an iterative formula based on the equation in (a) to calculate this root correct to 2 decimal places. Give the result of each iteration to 4 decimal places. [3]

.....

.....

.....

.....

.....

.....

.....

.....

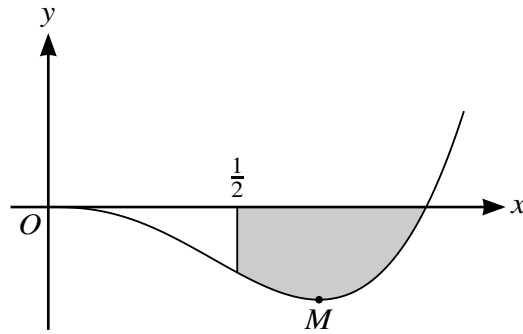
.....

.....

.....

.....

8



The diagram shows the curve $y = x^3 \ln x$, for $x > 0$, and its minimum point M .

(a) Find the exact coordinates of M .

[4]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

- (b)** Find the exact area of the shaded region bounded by the curve, the x -axis and the line $x = \frac{1}{2}$. [5]

[illegible]

- 9 The variables x and y satisfy the differential equation

$$\frac{dy}{dx} = e^{3y} \sin^2 2x.$$

It is given that $y = 0$ when $x = 0$.

Solve the differential equation and find the value of y when $x = \frac{1}{2}$.

[7]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

[illegible]

- 10** With respect to the origin O , the points A , B , C and D have position vectors given by

$$\overrightarrow{OA} = \begin{pmatrix} 3 \\ -1 \\ 2 \end{pmatrix}, \quad \overrightarrow{OB} = \begin{pmatrix} 1 \\ 2 \\ -3 \end{pmatrix}, \quad \overrightarrow{OC} = \begin{pmatrix} 1 \\ -2 \\ 5 \end{pmatrix} \quad \text{and} \quad \overrightarrow{OD} = \begin{pmatrix} 5 \\ -6 \\ 11 \end{pmatrix}.$$

- (a)** Find the obtuse angle between the vectors \overrightarrow{OA} and \overrightarrow{OB} . [3]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

The line l passes through the points A and B .

- (b)** Find a vector equation for the line l . [2]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

- (c) Find the position vector of the point of intersection of the line l and the line passing through C and D . [4]

[illegible]

[illegible]

[5]

[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.

[illegible]

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced online in the Cambridge Assessment International Education Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download at www.cambridgeinternational.org after the live examination series.

Cambridge Assessment International Education is part of Cambridge Assessment. Cambridge Assessment is the brand name of the University of Cambridge Local Examinations Syndicate (UCLES), which is a department of the University of Cambridge.