* 0000800000001 *

Cambridge Assessment International Education

Cambridge International AS & A Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

0834880949

MATHEMATICS **9709/21**

Paper 2 Pure Mathematics 2 **May/June 2025**

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.

DC (CJ/JG) 343353/4
© UCLES 2025

[Turn over

https://xtremepape.rs/

BLANK PAGE

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

https://xtremepape.rs/

1 Given that $y = 6x\cos\left(x^2 + 1\right)$, find an expression for $\frac{\mathrm{d}y}{\mathrm{d}x}$. [2]

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

https://xtremepape.rs/

2 **(a)** Use logarithms to solve the inequality $4^x < 0.05$. Give your answer in the form $x < a$, where the value of a is correct to 3 significant figures. [2]

.....

.....

.....

.....

.....

.....

.....

.....

(b) Solve the inequality $|3x + 8| < 9$. [3]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(c) Hence state the integers that satisfy both of the inequalities in parts **(a)** and **(b)**. [1]

.....

.....

.....

.....

.....

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

https://xtremepape.rs/

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

3 **(a)** Sketch, on a single diagram, the graphs of $y = 3e^{-2x}$ and $y = \sec x$ for values of x such that $0 \leqslant x < \frac{1}{2}\pi$. [2]

(b) Show that the x-coordinate of the point of intersection of the two graphs satisfies the equation $x = \frac{1}{2}\ln(3\cos x)$. [2]

.....

.....

.....

.....

.....

.....

(c) Use an iterative formula, based on the equation in part **(b)**, to find the x-coordinate of the point of intersection correct to 3 decimal places. Give the result of each iteration to 5 decimal places. [3]

.....

.....

.....

.....

.....

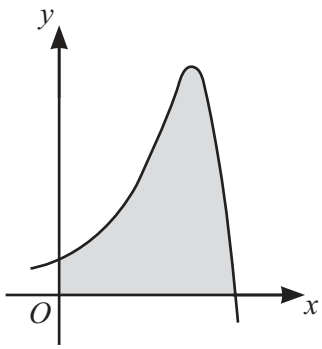
.....

.....

.....

https://xtremepape.rs/

4



The diagram shows the curve with equation $y = 6e^{2x} - e^{3x}$. The shaded region is bounded by the axes and the curve.

(a) Find the exact x-coordinate of the maximum point. [3]

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
https://xtremepape.rs/

(b) Find the area of the shaded region. Give your answer in the form $\frac{p}{q}$, where p and q are integers. [4]

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

https://xtremepape.rs/

5 The polynomial $\mathrm{p}(x)$ is defined by

$$\mathrm{p}(x) = ax^3 + bx^2 - ax - 24,$$

where a and b are constants. It is given that $(2x-3)$ is a factor of $\mathrm{p}(x)$ and that the remainder is -15 when $\mathrm{p}(x)$ is divided by $(x+1)$.

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

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
https://xtremepape.rs/

(b) Hence factorise $p(x)$ completely. [3]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(c) Hence solve the equation $p(3\operatorname{cosec}\theta) = 0$ for $90° < \theta < 270°$. [2]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

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

https://xtremepape.rs/

6 The parametric equations of a curve are

$$x = \frac{2t+1}{3t+4}, \qquad y = 2\ln(3t+4),$$

where $t > -\frac{4}{3}$.

(a) Show that $\frac{\mathrm{d}y}{\mathrm{d}x}$ can be expressed in the form $c(3t+4)$ and state the value of the constant c. [5]

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
https://xtremepape.rs/

(b) It is given that the gradient of the curve at the point (a, ln100) is m.

Find the values of a and m. [4]

(c) State whether the curve represents a decreasing function or an increasing function or neither. Give a reason for your answer. [1]

DO NOT WRITE IN THIS MARGIN

https://xtremepape.rs/

7 **(a)** Prove that $\sin^2 2x + 4\cos^2 x \cos 2x \equiv 4\cos^4 x$. [3]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(b) Find the set of possible values of the constant k for which the equation

$$\sin^2 2x + 4\cos^2 x \cos 2x + 5 = k$$

has no real solutions. [2]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

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

https://xtremepape.rs/

(c) Find the exact value of $\int_{-\frac{1}{3}\pi}^{\frac{1}{3}\pi} \sqrt{\sin^2 t + 4\cos^2\left(\frac{1}{2}t\right)\cos t}\,\mathrm{d}t$. [4]

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

https://xtremepape.rs/

Additional page

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

DO NOT WRITE IN THIS MARGIN

https://xtremepape.rs/

BLANK PAGE

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

https://xtremepape.rs/

BLANK PAGE

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

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.

https://xtremepape.rs/