



# Cambridge International AS & A Level

CANDIDATE  
NAME
CENTRE  
NUMBER

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**MATHEMATICS**
**9709/23**

Paper 2 Pure Mathematics 2

**May/June 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**

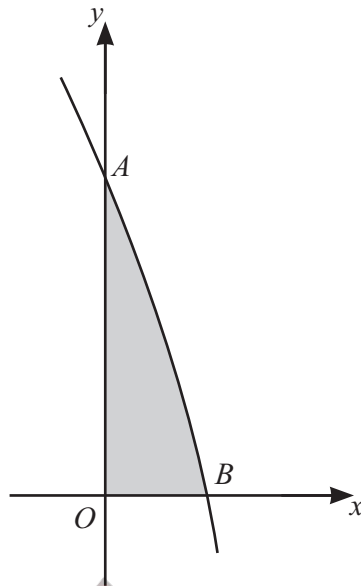
- The total mark for this paper is 50.
- The number of marks for each question or part question is shown in brackets [ ].

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

[4]



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The diagram shows the curve with equation  $y = 8e^{-x} - e^{2x}$ . The curve crosses the  $y$ -axis at the point  $A$  and the  $x$ -axis at the point  $B$ . The shaded region is bounded by the curve and the two axes.

- (a)** Find the gradient of the curve at  $A$ . [3]



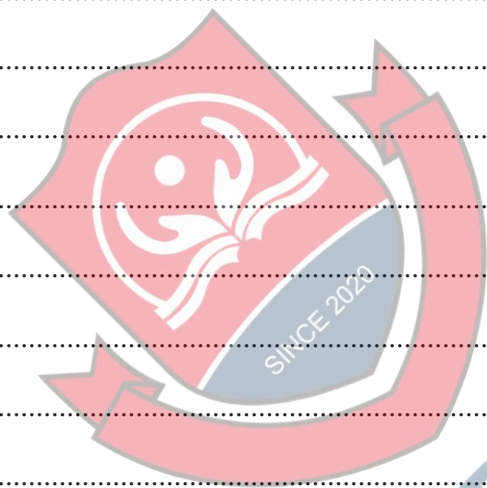
[5]

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$$x = 4 \cos^2 t, \quad y = \sqrt{3} \sin 2t,$$

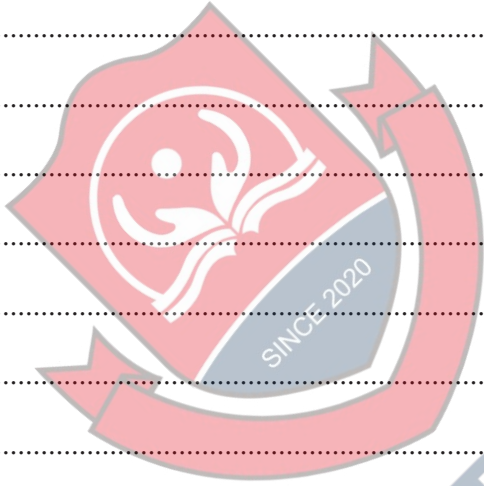
for values of  $t$  such that  $0 < t < \frac{1}{2}\pi$ .

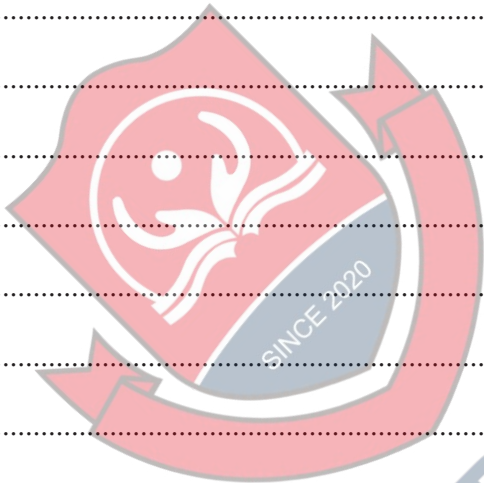
Find the equation of the normal to the curve at the point for which  $t = \frac{1}{6}\pi$ . Give your answer in the form  $ax + by + c = 0$  where  $a$ ,  $b$  and  $c$  are integers. [7]

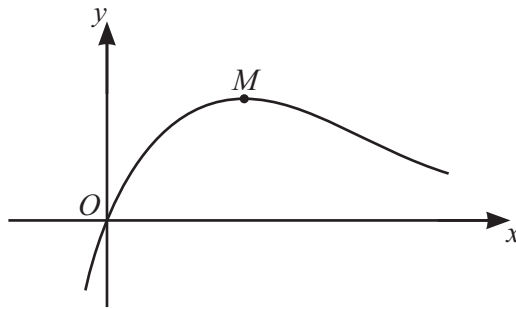


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(a) Find the quotient when  $p(x)$  is divided by  $(3x+2)$ , and show that the remainder is 6. [3]







The diagram shows the curve with equation  $y = \frac{\ln(2x+1)}{x+3}$ . The curve has a maximum point  $M$ .

- (a) Find an expression for  $\frac{dy}{dx}$ . [2]

- (b) Show that the  $x$ -coordinate of  $M$  satisfies the equation  $x = \frac{x+3}{\ln(2x+1)} - 0.5$ . [2]

Handwriting practice lines with a large watermark '40' in the background.





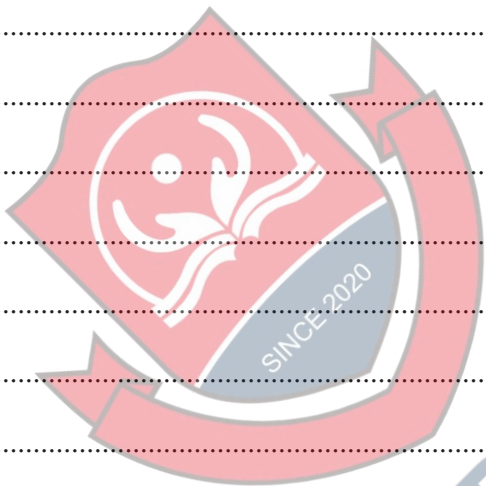
[2]



- [3]

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[2]



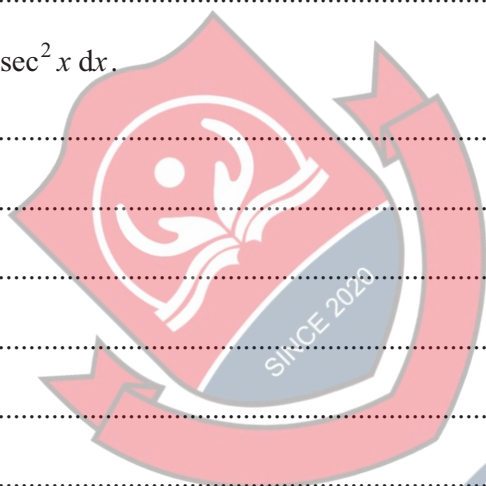
[5]





(c) Find  $\int 8 \sin^2 \frac{1}{2}x \operatorname{cosec}^2 x \, dx$ .

[3]



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



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