Cambridge Assessment International Education

Cambridge International AS & A Level

CANDIDATE NAME

CENTRE NUMBER | | | | | |

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7376156664

MATHEMATICS **9709/22**

Paper 2 Pure Mathematics 2 **October/November 2022**

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 **12** pages.

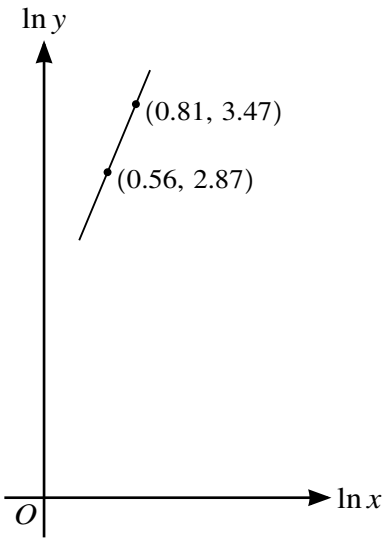
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1 Solve the equation $\sec\theta = 5\,\mathrm{cosec}\,\theta$ for $0° < \theta < 360°$. [4]

2 The solutions of the equation $|4x - 1| = |x + 3|$ are $x = p$ and $x = q$, where $p < q$.

Find the exact values of p and q, and hence determine the exact value of $|p - 2| - |q - 1|$. [5]

3



The variables x and y satisfy the equation $y = Ax^k$, where A and k are constants. The graph of $\ln y$ against $\ln x$ is a straight line passing through the points (0.56, 2.87) and (0.81, 3.47), as shown in the diagram.

Find the value of k, and the value of A correct to 2 significant figures. [5]

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4 The polynomial $p(x)$ is defined by

$$p(x) = ax^3 + 23x^2 - ax - 8,$$

where a is a constant. It is given that $(2x + 1)$ is a factor of $p(x)$.

(a) Find the value of a and hence factorise $p(x)$ completely. [5]

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(b) Hence solve the equation $p(e^{4y}) = 0$, giving your answer correct to 3 significant figures. [2]

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5 The curve with equation $y = x\ln(4x + 1) - 3x$ has one stationary point P.

(a) Show that the x-coordinate of P satisfies the equation

$$x = \frac{2x + 0.75}{\ln(4x + 1)} - 0.25.$$ [4]

(b) Show by calculation that the x-coordinate of P lies between 1.8 and 1.9. [2]

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(c) Use an iterative formula, based on the equation in part **(a)**, to find the x-coordinate of P correct to 3 significant figures. Give the result of each iteration to 5 significant figures. [3]

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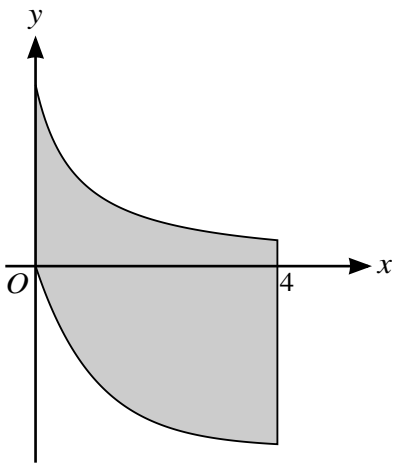
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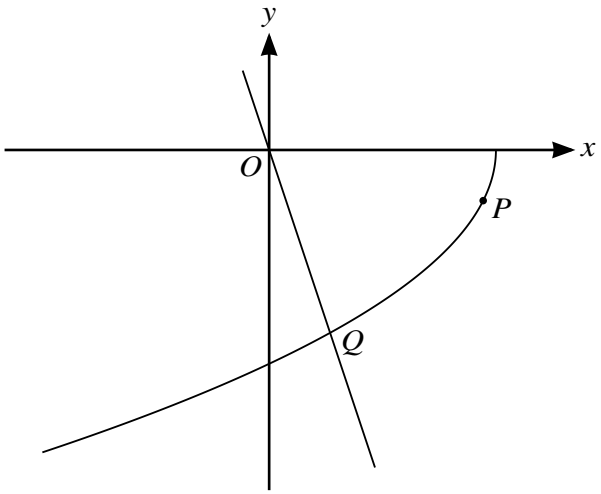
6



The diagram shows the curves $y = \dfrac{6}{3x+2}$ and $y = 3e^{-x} - 3$ for values of x between 0 and 4. The shaded region is bounded by the two curves and the lines $x = 0$ and $x = 4$.

Find the exact area of the shaded region, giving your answer in the form $\ln a + b + ce^{d}$. [9]

7



The diagram shows the curve with parametric equations

$$x = 3\cos 2\theta, \qquad y = 4\sin\theta,$$

for $\pi \leqslant \theta \leqslant \frac{3}{2}\pi$. Points P and Q lie on the curve. The gradient of the curve at P is 2. The straight line $3x + y = 0$ meets the curve at Q.

(a) Find the value of θ at P, giving your answer correct to 3 significant figures. [5]

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(b) Find the gradient of the curve at Q, giving your answer correct to 3 significant figures. [6]

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.

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