GradeMax

Cambridge International AS Level

Cambridge Assessment International Education
Cambridge International Advanced Subsidiary Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

* 9 7 1 8 7 4 9 7 8 0 9 *

MATHEMATICS **9709/22**

Paper 2 Pure Mathematics 2 **(P2)** **February/March 2019**

1 hour 15 minutes

Candidates answer on the Question Paper.

Additional Materials: List of Formulae (MF9)

READ THESE INSTRUCTIONS FIRST

Write your centre number, candidate number and name in the spaces at the top of this page.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** the questions in the space provided. If additional space is required, you should use the lined page at the end of this booklet. The question number(s) must be clearly shown.
Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place in the case of angles in degrees, unless a different level of accuracy is specified in the question.
The use of an electronic calculator is expected, where appropriate.
You are reminded of the need for clear presentation in your answers.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total number of marks for this paper is 50.

This document consists of **12** printed pages.

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1 Solve the equation $\sec^2 \theta + \tan^2 \theta = 5 \tan \theta + 4$ for $0° < \theta < 180°$. Show all necessary working. [4]

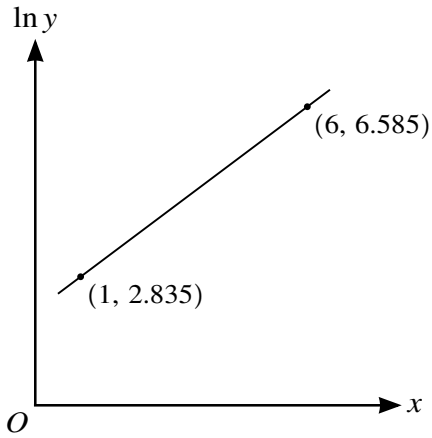
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2 Given that x satisfies the equation $|2x + 3| = |2x - 1|$, find the value of

$$|4x - 3| - |6x|.$$ [4]

3



The variables x and y satisfy the equation $y = Ae^{px+p}$, where A and p are constants. The graph of $\ln y$ against x is a straight line passing through the points (1, 2.835) and (6, 6.585), as shown in the diagram. Find the values of A and p. [5]

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4 **(i)** Find the quotient when $4x^3 + 8x^2 + 11x + 9$ is divided by $(2x + 1)$, and show that the remainder is 5. [3]

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(ii) Show that the equation $4x^3 + 8x^2 + 11x + 4 = 0$ has exactly one real root. [3]

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[Turn over

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5 The equation of a curve is $y = \dfrac{e^{2x}}{4x + 1}$ and the point P on the curve has y-coordinate 10.

(i) Show that the x-coordinate of P satisfies the equation $x = \frac{1}{2}\ln(40x + 10)$. [2]

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(ii) Use the iterative formula $x_{n+1} = \frac{1}{2}\ln(40x_n + 10)$ with $x_1 = 2.3$ to find the x-coordinate of P correct to 4 significant figures. Give the result of each iteration to 6 significant figures. [3]

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(iii) Find the gradient of the curve at P, giving the answer correct to 3 significant figures. [4]

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6 **(a)** Show that $\int_1^4 \left(\frac{2}{x} + \frac{2}{2x+1}\right) \mathrm{d}x = \ln 48$. [5]

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(b) Find $\int \sin 2x\,(\cot x + 2\,\mathrm{cosec}\,x)\,\mathrm{d}x$. [6]

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7 The parametric equations of a curve are

$$x = 2t - \sin 2t, \quad y = 5t + \cos 2t,$$

for $0 \leqslant t \leqslant \frac{1}{2}\pi$. At the point P on the curve, the gradient of the curve is 2.

(i) Show that the value of the parameter at P satisfies the equation $2 \sin 2t - 4 \cos 2t = 1$. [4]

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(ii) By first expressing $2\sin 2t - 4\cos 2t$ in the form $R\sin(2t - \alpha)$, where $R > 0$ and $0 < \alpha < \frac{1}{2}\pi$, find the coordinates of P. Give each coordinate correct to 3 significant figures. [7]

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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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