Cambridge International Examinations
Cambridge International Advanced Subsidiary Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

3907054137

MATHEMATICS **9709/21**

Paper 2 Pure Mathematics 2 **(P2)** **October/November 2018**

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 **13** printed pages and **3** blank pages.

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1 **(i)** Solve the equation $|9x - 2| = |3x + 2|$. [3]

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(ii) Hence, using logarithms, solve the equation $|3^{y+2} - 2| = |3^{y+1} + 2|$, giving your answer correct to 3 significant figures. [2]

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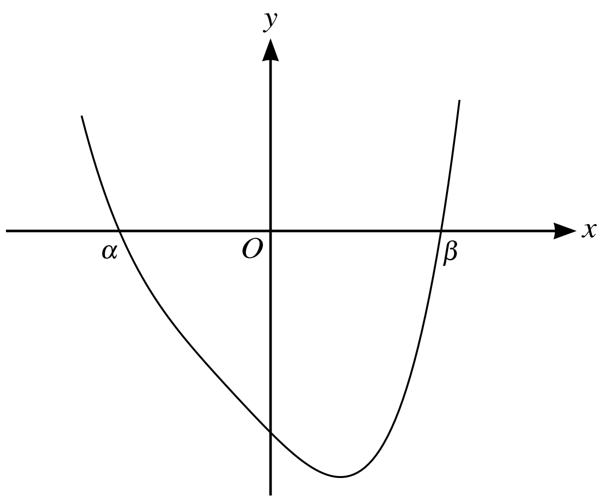
2 Show that $\int_1^7 \frac{6}{2x+1}\,dx = \ln 125.$ [5]

3 Solve the equation $\sec^2\theta = 3\operatorname{cosec}\theta$ for $0° < \theta < 180°$. [5]

4



The diagram shows the curve with equation

$$y = x^4 + 2x^3 + 2x^2 - 12x - 32.$$

The curve crosses the x-axis at points with coordinates $(\alpha, 0)$ and $(\beta, 0)$.

(i) Use the factor theorem to show that $(x + 2)$ is a factor of

$$x^4 + 2x^3 + 2x^2 - 12x - 32.$$ [2]

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(ii) Show that β satisfies an equation of the form $x = \sqrt[3]{(p + qx)}$, and state the values of p and q. [3]

(iii) Use an iterative formula based on the equation in part **(ii)** to find the value of β correct to 4 significant figures. Give the result of each iteration to 6 significant figures. [3]

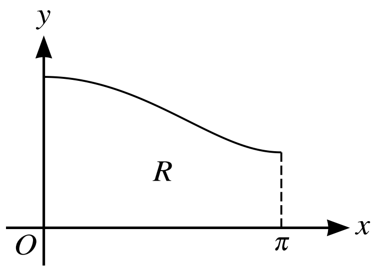
5 A curve has parametric equations

$$x = t + \ln(t + 1), \qquad y = 3te^{2t}.$$

(i) Find the equation of the tangent to the curve at the origin. [5]

(ii) Find the coordinates of the stationary point, giving each coordinate correct to 2 decimal places. [4]

6

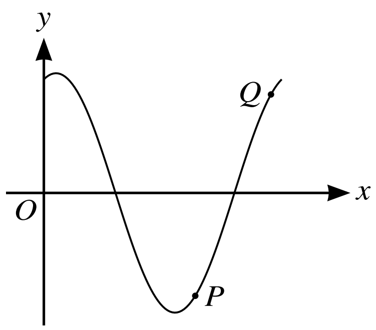


The diagram shows the curve with equation $y = \sqrt{\left(1 + 3\cos^2\left(\frac{1}{2}x\right)\right)}$ for $0 \leqslant x \leqslant \pi$. The region R is bounded by the curve, the axes and the line $x = \pi$.

(i) Use the trapezium rule with two intervals to find an approximation to the area of R, giving your answer correct to 3 significant figures. [3]

(ii) The region R is rotated completely about the x-axis. Without using a calculator, find the exact volume of the solid produced. [5]

7



The diagram shows the curve with equation $y = \sin 2x + 3\cos 2x$ for $0 \leqslant x \leqslant \pi$. At the points P and Q on the curve, the gradient of the curve is 3.

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

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(ii) By first expressing $\frac{dy}{dx}$ in the form $R\cos(2x + \alpha)$, where $R > 0$ and $0 < \alpha < \frac{1}{2}\pi$, find the x-coordinates of P and Q, giving your answers correct to 4 significant figures. [8]

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Additional Page

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