Cambridge International AS Level

Cambridge International Examinations
Cambridge International Advanced Subsidiary Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

8968864976

MATHEMATICS **9709/21**

Paper 2 Pure Mathematics 2 **(P2)** **May/June 2017**

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.
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.

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1 Given that $5^x = 3^{4y}$, use logarithms to show that $y = mx$ and find the value of the constant m correct to 3 significant figures. [3]

2 Solve the inequality $|4 - x| \leqslant |3 - 2x|$. [4]

3 Given that $\int_0^a 4e^{\frac{1}{2}x+3}\,dx = 835$, find the value of the constant a correct to 3 significant figures. [5]

4 The sequence of values given by the iterative formula

$$x_{n+1} = \frac{2x_n^2 + x_n + 9}{(x_n + 1)^2},$$

with $x_1 = 2$, converges to α.

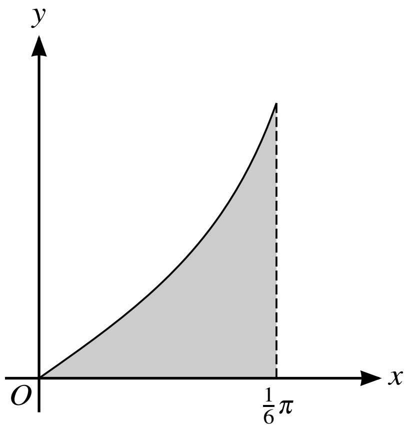
(i) Find the value of α correct to 2 decimal places, giving the result of each iteration to 4 decimal places. [3]

(ii) Determine the exact value of α. [3]

5 **(i)** Express $2\cos\theta + (\sqrt{5})\sin\theta$ in the form $R\cos(\theta - \alpha)$ where $R > 0$ and $0° < \alpha < 90°$, giving the value of α correct to 2 decimal places. [3]

(ii) Hence solve the equation $2\cos\theta + (\sqrt{5})\sin\theta = 1$ for $0° < \theta < 360°$. [4]

6



The diagram shows the curve $y = \tan 2x$ for $0 \leqslant x \leqslant \frac{1}{6}\pi$. The shaded region is bounded by the curve and the lines $x = \frac{1}{6}\pi$ and $y = 0$.

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

(ii) Find the exact volume of the solid formed when the shaded region is rotated completely about the x-axis. [4]

7 The parametric equations of a curve are

$$x = t^3 + 6t + 1, \qquad y = t^4 - 2t^3 + 4t^2 - 12t + 5.$$

(i) Find $\frac{dy}{dx}$ and use division to show that $\frac{dy}{dx}$ can be written in the form $at + b$, where a and b are constants to be found. [5]

(ii) The straight line $x - 2y + 9 = 0$ is the normal to the curve at the point P. Find the coordinates of P. [3]

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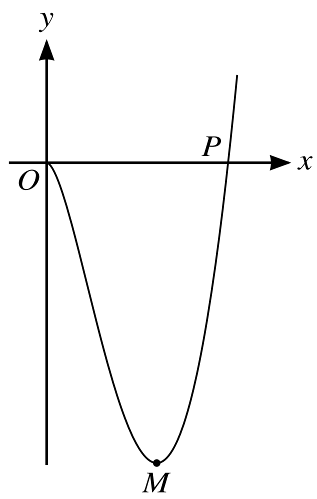

The diagram shows the curve with equation

$$y = 3x^2 \ln\left(\tfrac{1}{6}x\right).$$

The curve crosses the x-axis at the point P and has a minimum point M.

(i) Find the gradient of the curve at the point P. [5]

(ii) Find the exact coordinates of the point M. [5]

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