

CANDIDATE
NAME

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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.

This document consists of **11** printed pages and **1** blank page.

- 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]

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

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- 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]

This image shows a full page of a handwriting practice worksheet. It consists of multiple sets of three horizontal dashed lines, providing a guide for letter height and placement. The lines are evenly spaced across the entire page, leaving ample room for writing practice. There is no text or other markings on the page.

- 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]

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

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

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

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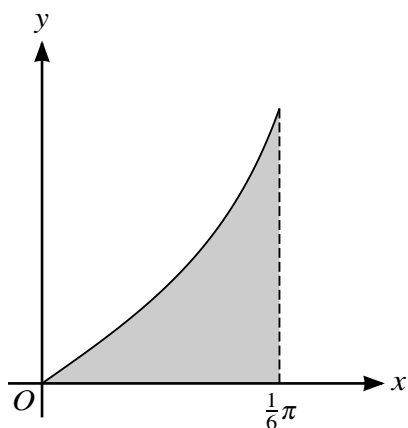
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(i) Use the trapezium rule with two intervals to find an approximation to the area of the shaded region, giving your answer correct to 3 significant figures. [3]

This image shows a full page of white paper with horizontal dotted lines. The lines are evenly spaced and run across the width of the page, providing a guide for handwriting practice. There are no margins, text, or other markings on the page.

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

[illegible]

7 The parametric equations of a curve are

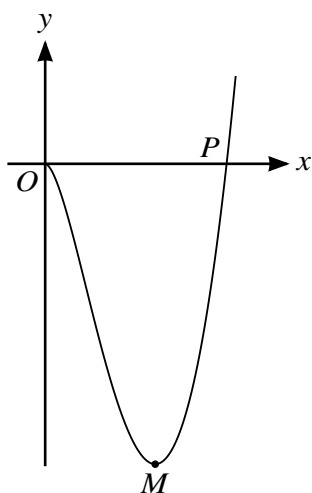
$$x = t^3 + 6t + 1, \quad y = t^4 - 2t^3 + 4t^2 - 12t + 5.$$

- (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]

[illegible]

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

This image shows a full page of a handwriting practice worksheet. It consists of approximately 20 horizontal rows. Each row is defined by two parallel dashed lines, creating a series of uniform gaps for letter height. The lines are evenly spaced across the entire page, providing a guide for consistent letter formation. There is no text or other markings on the page.


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

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

This image shows a full page of white paper with horizontal dashed lines, typical of primary-ruled notebook paper. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

This image shows a full page of a handwriting practice worksheet. It consists of approximately 20 horizontal rows. Each row is defined by two parallel dotted lines, creating a series of uniform gaps for letter height. The entire page is otherwise blank, with no margins, text, or other markings.

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