

CANDIDATE
NAME

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MATHEMATICS

9709/22

Paper 2 Pure Mathematics 2 (P2)

October/November 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.

1 The polynomial $f(x)$ is defined by

$$f(x) = x^4 - 3x^3 + 5x^2 - 6x + 11.$$

Find the quotient and remainder when $f(x)$ is divided by $(x^2 + 2)$. [3]

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

- 2 (i) Solve the equation $|4x + 5| = |x - 7|$. [3]

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- (ii) Hence, using logarithms, solve the equation $|2^{y+2} + 5| = |2^y - 7|$, giving the answer correct to 3 significant figures. [2]

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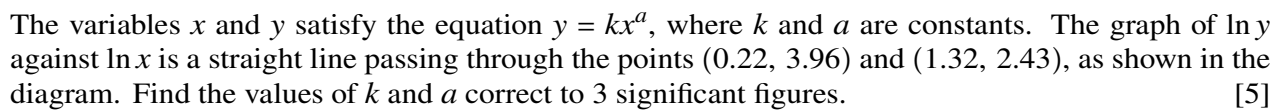
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- 4 The sequence x_1, x_2, x_3, \dots defined by

$$x_1 = 1, \quad x_{n+1} = \frac{x_n}{\ln(2x_n)}$$

converges to the value α .

- (i) Use the iterative formula to find the value of α correct to 4 significant figures. Give the result of each iteration to 6 significant figures. [3]

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- (ii) State an equation satisfied by α and hence determine the exact value of α . [2]

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- 5** Find the exact coordinates of the stationary point of the curve with equation $y = e^{-\frac{1}{2}x}(2x + 5)$. [5]

[illegible]

- 6 (a) Show that $\int_2^{18} \frac{3}{2x} dx = \ln 27$. [4]

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- (b) Find the exact value of $\int_0^{\frac{1}{6}\pi} 4 \sin^2\left(\frac{3}{2}x\right) dx$. Show all necessary working. [5]

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7 The parametric equations of a curve are

$$x = 3 \sin 2\theta, \quad y = 1 + 2 \tan 2\theta,$$

for $0 \leq \theta < \frac{1}{4}\pi$.

(i) Find the exact gradient of the curve at the point for which $\theta = \frac{1}{6}\pi$.

[4]

This image shows a full page of white paper with horizontal dashed lines, typical of primary school handwriting practice paper. The lines are evenly spaced and run across the entire width of the page. There are no margins, text, or other markings present.

[illegible]

- 8** (i) Express $0.5 \cos \theta - 1.2 \sin \theta$ 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]

This image shows a full page of a handwriting practice worksheet. It consists of multiple sets of three horizontal dashed lines spaced evenly down the page, providing a guide for letter height and placement. The background is plain white, and there are no other markings or text present.

- (ii) Hence solve the equation $0.5 \cos \theta - 1.2 \sin \theta = 0.8$ for $0^\circ < \theta < 360^\circ$. [4]

[illegible]

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(iii) Determine the greatest and least possible values of $(3 - \cos \theta + 2.4 \sin \theta)^2$ as θ varies. [3]

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[illegible]

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