

CANDIDATE
NAME

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MATHEMATICS

9709/32

Paper 3 Pure Mathematics 3 (P3)

February/March 2019

1 hour 45 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 75.

This document consists of **17** printed pages and **3** blank pages.

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- 1 (i) Show that the equation $\log_{10}(x - 4) = 2 - \log_{10} x$ can be written as a quadratic equation in x . [3]

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- (ii) Hence solve the equation $\log_{10}(x - 4) = 2 - \log_{10} x$, giving your answer correct to 3 significant figures. [2]

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- 2 The sequence of values given by the iterative formula

$$x_{n+1} = \frac{2x_n^6 + 12x_n}{3x_n^5 + 8},$$

with initial value $x_1 = 2$, converges to α .

- (i) Use the formula to calculate α correct to 4 decimal places. Give the result of each iteration to 6 decimal places. [3]

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

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- 3** (i) Given that $\sin(\theta + 45^\circ) + 2 \cos(\theta + 60^\circ) = 3 \cos \theta$, find the exact value of $\tan \theta$ in a form involving surds. You need not simplify your answer. [4]

[illegible]


- (ii) Hence solve the equation $\sin(\theta + 45^\circ) + 2 \cos(\theta + 60^\circ) = 3 \cos \theta$ for $0^\circ < \theta < 360^\circ$. [2]

[illegible]

4 Show that $\int_1^4 x^{-\frac{3}{2}} \ln x \, dx = 2 - \ln 4$.

[5]

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A circular logo located at the bottom right corner of the page. It features a grey outer ring with the words "GO AHEAD" written in white capital letters. Inside the ring is a red circle with a white arrow pointing towards the right.

- 5** The variables x and y satisfy the relation $\sin y = \tan x$, where $-\frac{1}{2}\pi < y < \frac{1}{2}\pi$. Show that

$$\frac{dy}{dx} = \frac{1}{\cos x \sqrt{(\cos 2x)}}. \quad [5]$$

This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and extend across the width of the page. In the bottom right corner, there is a small, partially visible circular logo with the word "HEAD" in a stylized font. The rest of the page is empty.

6 The variables x and y satisfy the differential equation

$$\frac{dy}{dx} = ky^3 e^{-x},$$

where k is a constant. It is given that $y = 1$ when $x = 0$, and that $y = \sqrt{e}$ when $x = 1$. Solve the differential equation, obtaining an expression for y in terms of x . [7]

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Give your answers in the form $x + iy$, where x and y are real.

[6]

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(b) The complex number u is given by

$$u = -1 - i.$$


On a sketch of an Argand diagram show the point representing u . Shade the region whose points represent complex numbers satisfying the inequalities $|z| < |z - 2i|$ and $\frac{1}{4}\pi < \arg(z - u) < \frac{1}{2}\pi$. [4]

8 Let $f(x) = \frac{12 + 12x - 4x^2}{(2 + x)(3 - 2x)}$.

(i) Express $f(x)$ in partial fractions.

[5]

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Handwriting practice paper with 20 horizontal dotted lines for writing.

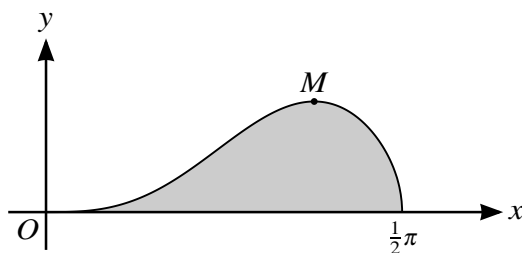
- 9** Two planes have equations $2x + 3y - z = 1$ and $x - 2y + z = 3$.

(i) Find the acute angle between the planes.

[4]

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[illegible]



(i) Using the substitution $u = \cos x$, find by integration the exact area of the shaded region bounded by the curve and the x -axis. [6]

This image shows a full page of handwriting practice paper. It features multiple sets of horizontal lines, each consisting of a solid top line, a dashed midline, and a solid bottom line. In the bottom right corner, there is a circular logo with the word "AHEAD" written in a curved path.

[illegible]

This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and extend across the width of the page. In the bottom right corner, there is a small, partially visible circular logo with the word "AHEAD" written inside it. The rest of the page is empty.



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