

CANDIDATE  
NAME

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CENTRE  
NUMBER

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CANDIDATE  
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## MATHEMATICS

**9709/22**

Paper 2 Pure Mathematics 2 (P2)

October/November 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** Use logarithms to solve the equation  $5^{3x-1} = 2^{4x}$ , giving your answer correct to 3 significant figures. [4]

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

- 2** It is given that  $x$  satisfies the equation  $|x + 1| = 4$ . Find the possible values of

$$|x+4|-|x-4|. \quad [4]$$

[illegible]

- 3 The equation of a curve is  $y = \tan \frac{1}{2}x + 3 \sin \frac{1}{2}x$ . The curve has a stationary point  $M$  in the interval  $\pi < x < 2\pi$ . Find the coordinates of  $M$ , giving each coordinate correct to 3 significant figures. [6]

[illegible]

- 4 The polynomials  $p(x)$  and  $q(x)$  are defined by

$$p(x) = x^3 + x^2 + ax - 15 \quad \text{and} \quad q(x) = 2x^3 + x^2 + bx + 21,$$

where  $a$  and  $b$  are constants. It is given that  $(x + 3)$  is a factor of  $p(x)$  and also of  $q(x)$ .

- (i) Find the values of  $a$  and  $b$ .

[3]

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- (ii) Show that the equation  $q(x) - p(x) = 0$  has only one real root.

[4]

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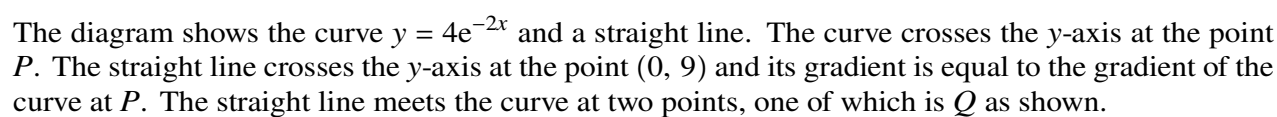
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- (ii)** Use an iterative formula based on the equation in part (i) to find the  $x$ -coordinate of  $Q$  correct to 3 significant figures. Give the result of each iteration to 5 significant figures. [3]

[illegible]

**6 (a)** Find the exact value of  $\int_0^{\frac{1}{4}\pi} \sin x(4 \sin x + 6 \cos x) \mathrm{d} x$ .

[5]

[illegible]



[illegible]

**7** The equation of a curve is  $x^2 + 4xy + 2y^2 = 7$ .

- (i) Find the equation of the tangent to the curve at the point  $(-1, 3)$ . Give your answer in the form  $ax + by + c = 0$  where  $a$ ,  $b$  and  $c$  are integers. [6]

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.

This image shows a full page of a worksheet designed for handwriting practice. It consists of multiple rows of horizontal dotted 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.

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