Cambridge International **AS Level**

Cambridge International Examinations
Cambridge International Advanced Subsidiary Level

CANDIDATE NAME	
CENTRE NUMBER	CANDIDATE NUMBER

3352279311

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.

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

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

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

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]

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

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

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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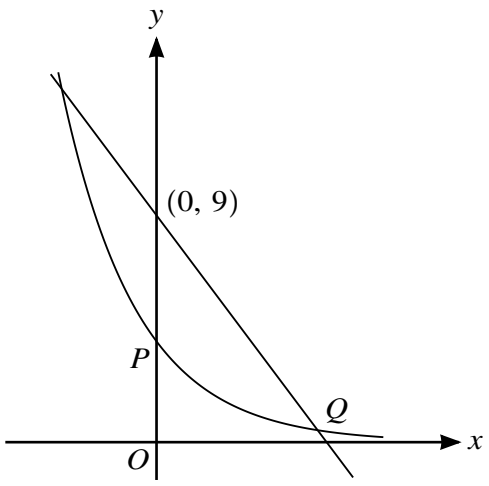

The diagram shows the curve $y = 4e^{-2x}$ and a straight line. The curve crosses the y-axis at the point P. The straight line crosses the y-axis at the point $(0, 9)$ and its gradient is equal to the gradient of the curve at P. The straight line meets the curve at two points, one of which is Q as shown.

(i) Show that the x-coordinate of Q satisfies the equation $x = \frac{9}{8} - \frac{1}{2}e^{-2x}$. [6]

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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]

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]

(b) Given that $\int_0^a \frac{6}{3x+2}\,\mathrm{d}x = \ln 49$, find the value of the positive constant a. [5]

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]

(ii) Show that there is no point on the curve at which the gradient is $\frac{1}{2}$. [4]

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