Cambridge International AS Level

Cambridge International Examinations
Cambridge International Advanced Subsidiary Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

5107779187

MATHEMATICS **9709/22**

Paper 2 Pure Mathematics 2 **(P2)** **February/March 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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CAMBRIDGE International Examinations

1 Solve the equation $2\ln(2x) - \ln(x+3) = \ln(3x+5)$. [5]

2 **(i)** Given that $\tan 2\theta \cot \theta = 8$, show that $\tan^2 \theta = \frac{3}{4}$. [3]

(ii) Hence solve the equation $\tan 2\theta \cot \theta = 8$ for $0° < \theta < 180°$. [2]

3 **(i)** Solve the inequality $|2x - 5| < |x + 3|$. [4]

(ii) Hence find the largest integer y satisfying the inequality $|2\ln y - 5| < |\ln y + 3|$. [2]

4 Find the gradient of the curve

$$x^2 \sin y + \cos 3y = 4$$

at the point $(2, \frac{1}{2}\pi)$. [6]

5 It is given that a is a positive constant such that

$$\int_0^a (1 + 2x + 3e^{3x})\,dx = 250.$$

(i) Show that $a = \frac{1}{3}\ln(251 - a - a^2)$. [5]

(ii) Use an iterative formula based on the equation in part **(i)** to find the value of a correct to 4 significant figures. Give the result of each iteration to 6 significant figures. [3]

6 The polynomial $p(x)$ is defined by

$$p(x) = ax^3 + bx^2 - 17x - a,$$

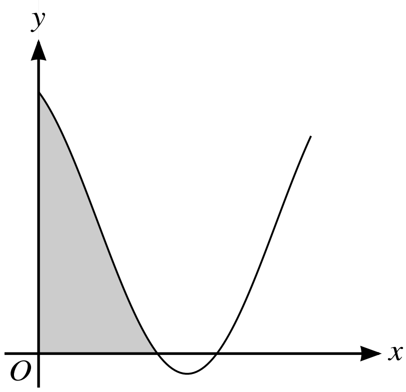
where a and b are constants. It is given that $(x + 2)$ is a factor of $p(x)$ and that the remainder is 28 when $p(x)$ is divided by $(x - 2)$.

(i) Find the values of a and b. [5]

(ii) Hence factorise $p(x)$ completely. [3]

(iii) State the number of roots of the equation $p(2^y) = 0$, justifying your answer. [2]

7



The diagram shows part of the curve

$$y = 2\cos 2x \cos\left(2x + \tfrac{1}{6}\pi\right).$$

The shaded region is bounded by the curve and the two axes.

(i) Show that $2\cos 2x \cos\left(2x + \frac{1}{6}\pi\right)$ can be expressed in the form

$$k_1(1 + \cos 4x) + k_2 \sin 4x,$$

where the values of the constants k_1 and k_2 are to be determined. [5]

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(ii) Find the exact area of the shaded region. [5]

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