Cambridge International AS Level

Cambridge International Examinations
Cambridge International Advanced Subsidiary Level

MATHEMATICS **9709/22**

Paper 2 Pure Mathematics 2 **(P2)** **February/March 2016**

1 hour 15 minutes

Additional Materials: Answer Booklet/Paper
Graph Paper
List of Formulae (MF9)

READ THESE INSTRUCTIONS FIRST

If you have been given an Answer Booklet, follow the instructions on the front cover of the Booklet.
Write your Centre number, candidate number and name on all the work you hand in.
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.
Questions carrying smaller numbers of marks are printed earlier in the paper, and questions carrying larger numbers of marks later in the paper.

This document consists of **3** printed pages and **1** blank page.

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1 Find the quotient and the remainder when $2x^3 + 3x^2 + 10$ is divided by $(x + 2)$. [3]

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

3 It is given that k is a positive constant. Solve the equation $2\ln x = \ln(3k + x) + \ln(2k - x)$, expressing x in terms of k. [5]

4 The sequence of values given by the iterative formula

$$x_{n+1} = \sqrt{\left(\tfrac{1}{2}x_n^2 + 4x_n^{-3}\right)},$$

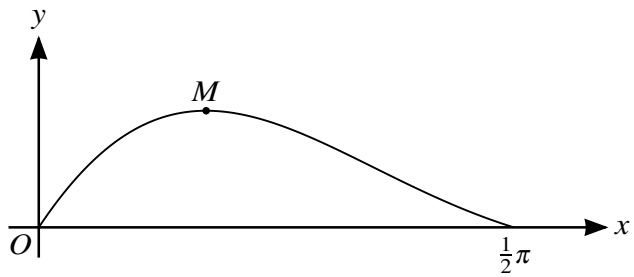
with initial value $x_1 = 1.5$, converges to α.

(i) Use this iterative formula to find α correct to 3 decimal places. Give the result of each iteration to 5 decimal places. [3]

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

5 Given that $\int_0^a 6e^{2x+1}\,dx = 65$, find the value of a correct to 3 decimal places. [5]

6



The diagram shows the part of the curve $y = 3e^{-x}\sin 2x$ for $0 \leqslant x \leqslant \frac{1}{2}\pi$, and the stationary point M.

(i) Find the equation of the tangent to the curve at the origin. [4]

(ii) Find the coordinates of M, giving each coordinate correct to 3 decimal places. [4]

7 The equation of a curve is $2x^3 + y^3 = 24$.

(i) Express $\dfrac{dy}{dx}$ in terms of x and y, and show that the gradient of the curve is never positive. [4]

(ii) Find the coordinates of the two points on the curve at which the gradient is -2. [5]

8 **(i)** Show that $\sin 2x \cot x \equiv 2\cos^2 x$. [2]

(ii) Using the identity in part **(i)**,

(a) find the least possible value of

$$3\sin 2x \cot x + 5\cos 2x + 8$$

as x varies, [4]

(b) find the exact value of $\int_{\frac{1}{8}\pi}^{\frac{1}{6}\pi} \operatorname{cosec} 4x \tan 2x \, \mathrm{d}x$. [5]

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