Cambridge International Examinations
Cambridge International Advanced Subsidiary Level

MATHEMATICS **9709/23**

Paper 2 Pure Mathematics 2 **(P2)** **May/June 2014**

1 hour 15 minutes

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

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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 **(i)** Solve the equation $|x+2| = |x-13|$. [2]

(ii) Hence solve the equation $|3^y + 2| = |3^y - 13|$, giving your answer correct to 3 significant figures. [2]

2 Solve the equation $3\sin 2\theta \tan\theta = 2$ for $0° < \theta < 180°$. [4]

3 **(a)** Find $\int 4\cos\left(\frac{1}{3}x + 2\right)\,dx$. [2]

(b) Use the trapezium rule with three intervals to find an approximation to

$$\int_0^{12} \sqrt{(4+x^2)}\,dx,$$

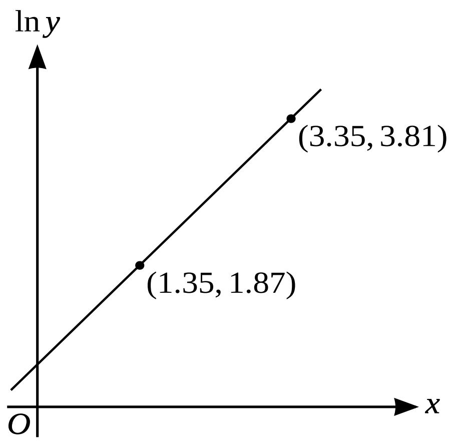
giving your answer correct to 3 significant figures. [3]

4 The parametric equations of a curve are

$$x = 2\ln(t+1), \quad y = 4e^t.$$

Find the equation of the tangent to the curve at the point for which $t = 0$. Give your answer in the form $ax + by + c = 0$, where a, b and c are integers. [6]

5



The variables x and y satisfy the equation $y = K(2^{px})$, where K and p are constants. The graph of $\ln y$ against x is a straight line passing through the points (1.35, 1.87) and (3.35, 3.81), as shown in the diagram. Find the values of K and p correct to 2 decimal places. [6]

6 The polynomial $\mathrm{p}(x)$ is defined by

$$\mathrm{p}(x) = x^3 + 2x + a,$$

where a is a constant.

(i) Given that $(x + 2)$ is a factor of $\mathrm{p}(x)$, find the value of a. [2]

(ii) When a has this value, find the quotient when $\mathrm{p}(x)$ is divided by $(x + 2)$ and hence show that the equation $\mathrm{p}(x) = 0$ has exactly one real root. [5]

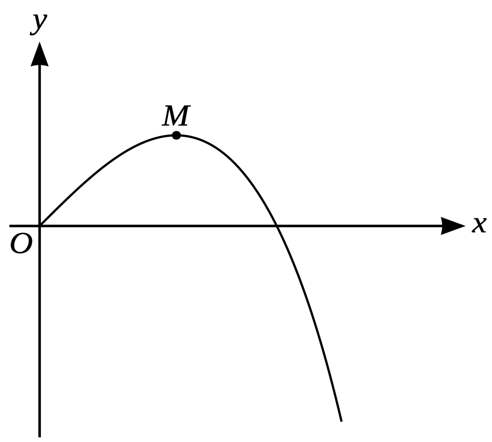
7 It is given that $\int_0^a \left(\frac{1}{2}\mathrm{e}^{3x} + x^2\right) \mathrm{d}x = 10$, where a is a positive constant.

(i) Show that $a = \frac{1}{3}\ln(61 - 2a^3)$. [4]

(ii) Show by calculation that the value of a lies between 1.0 and 1.5. [2]

(iii) Use an iterative formula, based on the equation in part **(i)**, to find the value of a correct to 3 decimal places. Give the result of each iteration to 5 decimal places. [3]

8



The diagram shows the curve

$$y = \tan x \cos 2x, \text{ for } 0 \leqslant x < \tfrac{1}{2}\pi,$$

and its maximum point M.

(i) Show that $\dfrac{\mathrm{d}y}{\mathrm{d}x} = 4\cos^2 x - \sec^2 x - 2$. [5]

(ii) Hence find the x-coordinate of M, giving your answer correct to 2 decimal places. [4]

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