Cambridge International Examinations
Cambridge International Advanced Subsidiary Level

MATHEMATICS **9709/23**

Paper 2 Pure Mathematics 2 **(P2)** **October/November 2015**

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 **2** printed pages and **2** blank pages.

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1 Find the exact value of $\displaystyle\int_{-1}^{35} \frac{3}{2x+5}\,\mathrm{d}x$, giving the answer in the form $\ln k$. [5]

2 **(i)** Solve the equation $|2x+3| = |x+8|$. [3]

(ii) Hence, using logarithms, solve the equation $|2^{y+1}+3| = |2^y+8|$. Give the answer correct to 3 significant figures. [2]

3 The parametric equations of a curve are

$$x = (t+1)\mathrm{e}^t, \qquad y = 6(t+4)^{\frac{1}{2}}.$$

Find the equation of the tangent to the curve when $t = 0$, giving the answer in the form $ax + by + c = 0$ where a, b and c are integers. [6]

4 **(i)** Find the quotient when $3x^3 + 5x^2 - 2x - 1$ is divided by $(x-2)$, and show that the remainder is 39. [4]

(ii) Hence show that the equation $3x^3 + 5x^2 - 2x - 40 = 0$ has exactly one real root. [3]

5 It is given that $\displaystyle\int_0^a (3\mathrm{e}^{3x} + 5\mathrm{e}^x)\,\mathrm{d}x = 100$, where a is a positive constant.

(i) Show that $a = \frac{1}{3}\ln(106 - 5\mathrm{e}^a)$. [5]

(ii) 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]

6 **(i)** Express $(\sqrt{5})\cos\theta - 2\sin\theta$ in the form $R\cos(\theta+\alpha)$, where $R > 0$ and $0° < \alpha < 90°$. Give the value of α correct to 2 decimal places. [3]

(ii) Hence

(a) solve the equation $(\sqrt{5})\cos\theta - 2\sin\theta = 0.9$ for $0° < \theta < 360°$, [4]

(b) state the greatest and least values of

$$10 + (\sqrt{5})\cos\theta - 2\sin\theta$$

as θ varies. [2]

7 The equation of a curve is $y = \dfrac{\sin 2x}{\cos x + 1}$.

(i) Show that $\dfrac{\mathrm{d}y}{\mathrm{d}x} = \dfrac{2(\cos^2 x + \cos x - 1)}{\cos x + 1}$. [7]

(ii) Find the x-coordinate of each stationary point of the curve in the interval $-\pi < x < \pi$. Give each answer correct to 3 significant figures. [3]

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