Cambridge International AS Level

Cambridge International Examinations
Cambridge International Advanced Subsidiary Level

CANDIDATE NAME	

CENTRE NUMBER		CANDIDATE NUMBER	

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MATHEMATICS **9709/23**

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

JC17 06_9709_23/FP

CAMBRIDGE International Examinations

[Turn over

1 Solve the equation $|x + a| = |2x - 5a|$, giving x in terms of the positive constant a. [3]

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

3 **(i)** By sketching a suitable pair of graphs, show that the equation

$$x^3 = 11 - 2x$$

has exactly one real root. [2]

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(ii) Use the iterative formula

$$x_{n+1} = \sqrt[3]{(11 - 2x_n)}$$

to find the root correct to 4 significant figures. Give the result of each iteration to 6 significant figures. [3]

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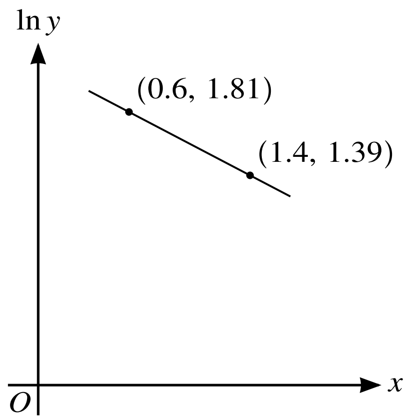
4 Find the equation of the tangent to the curve $y = \dfrac{e^{4x}}{2x+3}$ at the point on the curve for which $x = 0$. Give your answer in the form $ax + by + c = 0$ where a, b and c are integers. [5]

5



The variables x and y satisfy the equation $y = \frac{K}{a^{2x}}$, where K and a are constants. The graph of $\ln y$ against x is a straight line passing through the points (0.6, 1.81) and (1.4, 1.39), as shown in the diagram. Find the values of K and a correct to 2 significant figures. [6]

6 **(i)** Use the factor theorem to show that $(x+2)$ is a factor of the expression

$$6x^3 + 13x^2 - 33x - 70$$

and hence factorise the expression completely. [5]

(ii) Deduce the roots of the equation

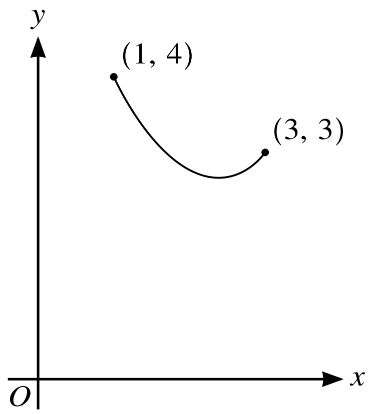
$$6 + 13y - 33y^2 - 70y^3 = 0.$$ [2]

7 **(a)** Find $\int (2\cos\theta - 3)(\cos\theta + 1)\,d\theta$. [4]

(b) **(i)** Find $\int \left(\frac{4}{2x+1} + \frac{1}{2x} \right) \mathrm{d}x$. [2]

(ii) Hence find $\int_1^4 \left(\frac{4}{2x+1} + \frac{1}{2x} \right) \mathrm{d}x$, giving your answer in the form $\ln k$. [3]

8



The diagram shows the curve with parametric equations

$$x = 2 - \cos 2t, \qquad y = 2\sin^3 t + 3\cos^3 t + 1$$

for $0 \leqslant t \leqslant \frac{1}{2}\pi$. The end-points of the curve are $(1, 4)$ and $(3, 3)$.

(i) Show that $\dfrac{dy}{dx} = \frac{3}{2}\sin t - \frac{9}{4}\cos t$. [5]

(ii) Find the coordinates of the minimum point, giving each coordinate correct to 3 significant figures. [3]

(iii) Find the exact gradient of the normal to the curve at the point for which $x = 2$. [3]

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