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Cambridge International AS Level

Cambridge International Examinations
Cambridge International Advanced Subsidiary Level

MATHEMATICS **9709/21**

Paper 2 Pure Mathematics 2 **(P2)** **May/June 2015**

1 hour 15 minutes

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

7143817068

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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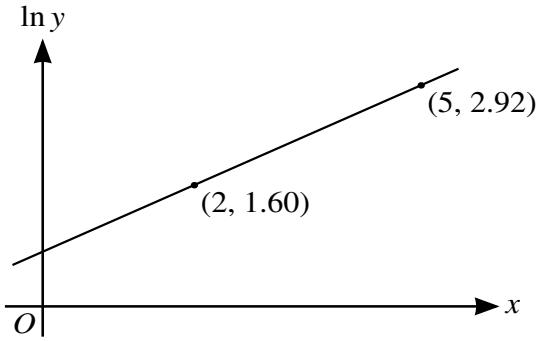
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1 **(i)** Solve the equation $|3x + 4| = |3x - 11|$. [3]

(ii) Hence, using logarithms, solve the equation $|3 \times 2^y + 4| = |3 \times 2^y - 11|$, giving the answer correct to 3 significant figures. [2]

2



The variables x and y satisfy the equation

$$y = Ae^{p(x-1)},$$

where A and p are constants. The graph of $\ln y$ against x is a straight line passing through the points (2, 1.60) and (5, 2.92), as shown in the diagram. Find the values of A and p correct to 2 significant figures. [5]

3 The equation of a curve is

$$y = 6\sin x - 2\cos 2x.$$

Find the equation of the tangent to the curve at the point $\left(\frac{1}{6}\pi, 2\right)$. Give the answer in the form $y = mx + c$, where the values of m and c are correct to 3 significant figures. [5]

4 The polynomials $\mathrm{f}(x)$ and $\mathrm{g}(x)$ are defined by

$$\mathrm{f}(x) = x^3 + ax^2 + b \quad \text{and} \quad \mathrm{g}(x) = x^3 + bx^2 - a,$$

where a and b are constants. It is given that $(x + 2)$ is a factor of $\mathrm{f}(x)$. It is also given that, when $\mathrm{g}(x)$ is divided by $(x + 1)$, the remainder is -18.

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

(ii) When a and b have these values, find the greatest possible value of $\mathrm{g}(x) - \mathrm{f}(x)$ as x varies. [2]

5 **(i)** Given that $\int_0^a (3e^{\frac{1}{2}x} + 1)\,dx = 10$, show that the positive constant a satisfies the equation

$$a = 2\ln\left(\frac{16 - a}{6}\right). \quad [5]$$

(ii) Use the iterative formula $a_{n+1} = 2\ln\left(\frac{16 - a_n}{6}\right)$ with $a_1 = 2$ to find the value of a correct to 3 decimal places. Give the result of each iteration to 5 decimal places. [3]

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6 **(i)** Prove that $2\,\mathrm{cosec}\,2\theta\tan\theta \equiv \sec^2\theta$. [3]

(ii) Hence

(a) solve the equation $2\,\mathrm{cosec}\,2\theta\tan\theta = 5$ for $0 < \theta < \pi$, [3]

(b) find the exact value of $\int_0^{\frac{1}{6}\pi} 2\,\mathrm{cosec}\,4x\tan 2x\,\mathrm{d}x$. [4]

7 The equation of a curve is

$$y^3 + 4xy = 16.$$

(i) Show that $\dfrac{\mathrm{d}y}{\mathrm{d}x} = -\dfrac{4y}{3y^2 + 4x}$. [4]

(ii) Show that the curve has no stationary points. [2]

(iii) Find the coordinates of the point on the curve where the tangent is parallel to the y-axis. [4]

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