Cambridge International AS Level

Cambridge International Examinations
Cambridge International Advanced Subsidiary Level

MATHEMATICS **9709/23**

Paper 2 Pure Mathematics 2 **(P2)** **October/November 2014**

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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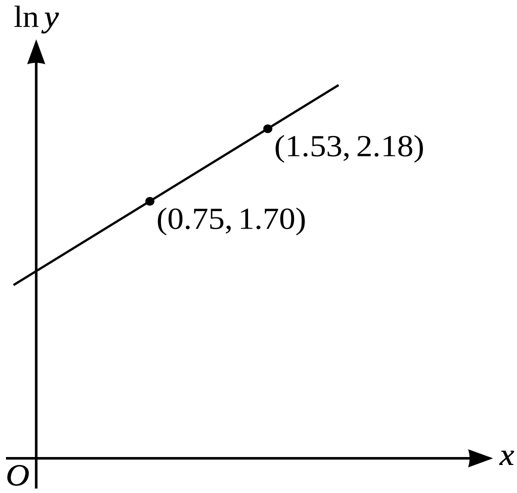
1 Use the trapezium rule with four intervals to find an approximation to

$$\int_1^5 |2^x - 8| \, dx. \qquad [3]$$

2



The variables x and y satisfy the equation $y = a(b^x)$, where a and b are constants. The graph of $\ln y$ against x is a straight line passing through the points (0.75, 1.70) and (1.53, 2.18), as shown in the diagram. Find the values of a and b correct to 2 decimal places. [5]

3 **(a)** Find $\int 4\cos^2\left(\frac{1}{2}\theta\right) d\theta$. [3]

(b) Find the exact value of $\int_{-1}^{6} \frac{1}{2x+3} \, dx$. [4]

4 For each of the following curves, find the exact gradient at the point indicated:

(i) $y = 3\cos 2x - 5\sin x$ at $\left(\frac{1}{6}\pi, -1\right)$, [3]

(ii) $x^3 + 6xy + y^3 = 21$ at $(1, 2)$. [5]

5 **(i)** Given that $(x+2)$ and $(x+3)$ are factors of

$$5x^3 + ax^2 + b,$$

find the values of the constants a and b. [4]

(ii) When a and b have these values, factorise

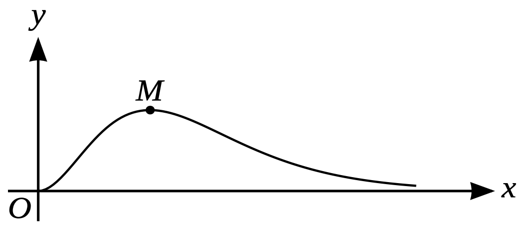
$$5x^3 + ax^2 + b$$

completely, and hence solve the equation

$$5^{3y+1} + a \times 5^{2y} + b = 0,$$

giving any answers correct to 3 significant figures. [5]

6



The diagram shows part of the curve $y = \dfrac{x^2}{1 + e^{3x}}$ and its maximum point M. The x-coordinate of M is denoted by m.

(i) Find $\dfrac{dy}{dx}$ and hence show that m satisfies the equation $x = \frac{2}{3}(1 + e^{-3x})$. [4]

(ii) Show by calculation that m lies between 0.7 and 0.8. [2]

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

7 The angle α lies between 0° and 90° and is such that

$$2\tan^2\alpha + \sec^2\alpha = 5 - 4\tan\alpha.$$

(i) Show that

$$3\tan^2\alpha + 4\tan\alpha - 4 = 0$$

and hence find the exact value of $\tan\alpha$. [4]

(ii) It is given that the angle β is such that $\cot(\alpha + \beta) = 6$. Without using a calculator, find the exact value of $\cot\beta$. [5]

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