CAMBRIDGE
International Education

Cambridge International AS & A Level

MATHEMATICS **9709/02**

Paper 2 Pure Mathematics 2 **For examination from 2027**

SPECIMEN PAPER **1 hour 15 minutes**

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You must answer on the printed answer booklet.

You will need: Printed answer booklet
List of formulae (MF19)

INSTRUCTIONS

- Answer **all** questions.
- Write your answers on the printed answer booklet. Follow the instructions on the front cover of the answer booklet.
- You should use a calculator where appropriate.
- You must show all necessary working clearly; no marks will be given for unsupported answers from a calculator.
- Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place for angles in degrees, unless a different level of accuracy is specified in the question.

INFORMATION

- The total mark for this paper is 50.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **4** pages.

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[Turn over

1 **(a)** The polynomial $2x^3 + ax^2 - ax - 12$, where a is a constant, is denoted by $\mathrm{p}(x)$. It is given that $(x + 1)$ is a factor of $\mathrm{p}(x)$.

Find the value of a. [2]

(b) When a has this value, find the remainder when $\mathrm{p}(x)$ is divided by $(x + 3)$. [2]

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

3 It is given that a is a positive constant.

(a) **(i)** Sketch on a single diagram the graphs of $y = |2x - 3a|$ and $y = |2x + 4a|$. [2]

(ii) State the coordinates of each of the points where each graph meets an axis. [1]

(b) Solve the inequality $|2x - 3a| < |2x + 4a|$. [3]

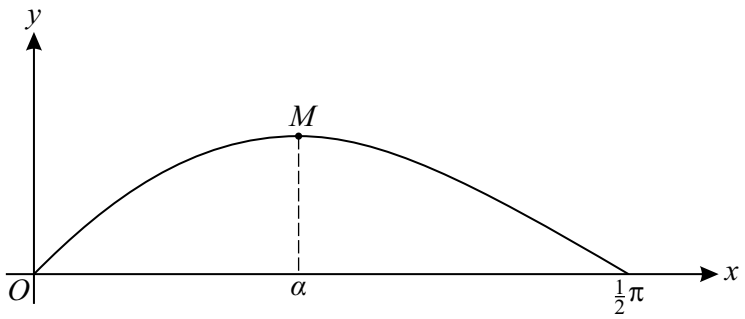
4 **(a)** Solve the equation $5^{2x} + 5^x = 12$, giving your answer correct to 3 significant figures. [4]

(b) It is given that $\ln(y + 5) - \ln y = 2\ln x$.

Express y in terms of x, in a form not involving logarithms. [4]

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5



The diagram shows the curve $y = \dfrac{\sin 2x}{x+2}$ for $0 \leqslant x \leqslant \frac{1}{2}\pi$. The x-coordinate of the maximum point M is denoted by α.

(a) Find $\dfrac{\mathrm{d}y}{\mathrm{d}x}$ and show that α satisfies the equation $\tan 2x = 2x + 4$. [4]

(b) Show by calculation that α lies between 0.6 and 0.7. [2]

(c) Use the iterative formula $x_{n+1} = \frac{1}{2}\tan^{-1}(2x_n + 4)$ to find the value of α correct to 3 decimal places. Give the result of each iteration to 5 decimal places. [3]

6 The parametric equations of a curve are

$$x = \mathrm{e}^{2t}, \quad y = 4t\mathrm{e}^{t}.$$

(a) Show that $\dfrac{\mathrm{d}y}{\mathrm{d}x} = \dfrac{2(t+1)}{\mathrm{e}^{t}}$. [4]

(b) Find the equation of the normal to the curve at the point where $t = 0$. [4]

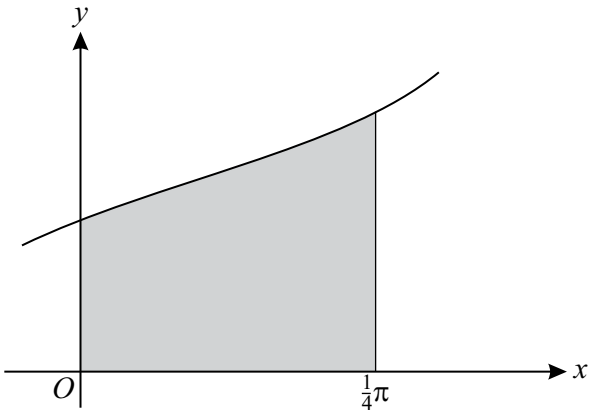
Question 7 is on the back page.

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7 **(a)** Show that $\tan^2 x + \cos^2 x \equiv \sec^2 x + \frac{1}{2}\cos 2x - \frac{1}{2}$ and hence find the exact value of

$$\int_0^{\frac{1}{4}\pi} (\tan^2 x + \cos^2 x)\,\mathrm{d}x. \qquad [7]$$

(b)



The region enclosed by the curve $y = \tan x + \cos x$ and the lines $x = 0$, $x = \frac{1}{4}\pi$ and $y = 0$ is shown in the diagram.

Find the exact volume of the solid produced when this region is rotated completely about the x-axis. [4]

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