Cambridge Assessment International Education

Cambridge International AS & A Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

0123456789

MATHEMATICS **9709/02**

Paper 2 Pure Mathematics 2 **For examination from 2020**

SPECIMEN PAPER **1 hour 15 minutes**

You must answer on the question paper.

You will need: List of formulae (MF19)

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- If additional space is needed, you should use the lined page at the end of this booklet; the question number or numbers must be clearly shown.
- 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 **14** pages. Blank pages are indicated.

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

Find the value of a. [2]

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

2 Solve the equation $\sin 2\theta \tan \theta = 2$ 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 the axes. [1]

. . .

. . .

. . .

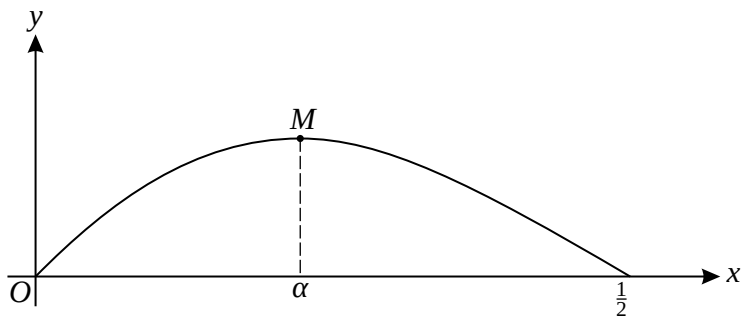
(b) Solve the inequality $|2x-3a|<|2x+4a|$. [3]

4 **(a)** Solve the equation $2^{2x} + 5^x = 7$, 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]

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 $\dfrac{dy}{dx}$ 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 $x_{n+1} = \frac{1}{2}\tan^{-1}(2x_n + 1)$ to find the value of α correct to 3 decimal places. Give the result for each iteration to 5 decimal places. [3]

6 The parametric equations of a curve are

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

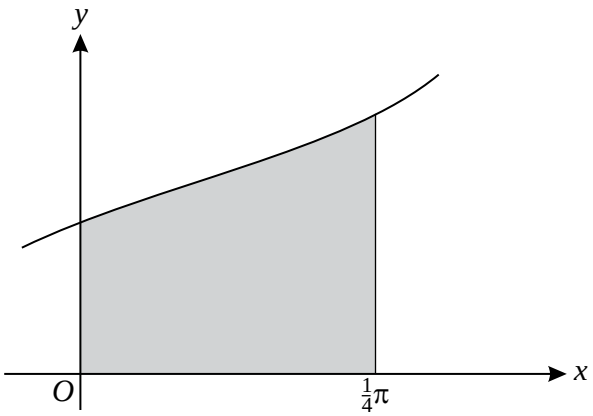
(a) Show that $\dfrac{dy}{dx} = \dfrac{2(t+1)}{e^{t}}$. [4]

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

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]

Additional page

If you use the following lined page to complete the answer(s) to any question(s), the question number(s) must be clearly shown.