

Cambridge International AS & A Level

CANDIDATE
NAME

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CENTRE
NUMBER

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MATHEMATICS

9709/22

Paper 2 Pure Mathematics 2

October/November 2020

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 **16** pages. Blank pages are indicated.

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- 1** Solve the equation $7 \cot \theta = 3 \operatorname{cosec} \theta$ for $0^\circ < \theta < 90^\circ$. [3]

This image shows a full page of white paper with horizontal dashed lines, typical of primary-ruled notebook paper. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

- 2** Given that $\frac{2^{3x+2} + 8}{2^{3x} - 7} = 5$, find the value of 2^{3x} and hence, using logarithms, find the value of x correct to 4 significant figures. [5]

This image shows a single page of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

- 3 (a) Sketch, on a single diagram, the graphs of $y = \left| \frac{1}{2}x - a \right|$ and $y = \frac{3}{2}x - \frac{1}{2}a$, where a is a positive constant. [2]

- (b) Find the coordinates of the point of intersection of the two graphs. [3]

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- (c) Deduce the solution of the inequality $\left| \frac{1}{2}x - a \right| > \frac{3}{2}x - \frac{1}{2}a$. [1]

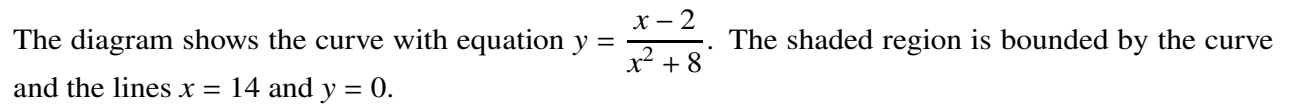
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- [illegible]

- (b) Use the trapezium rule with three intervals to find an approximation to the area of the shaded region. Give the answer correct to 2 significant figures. [3]

[illegible]

5 The equation of a curve is $2e^{2x}y - y^3 + 4 = 0$.

(a) Show that $\frac{dy}{dx} = \frac{4e^{2x}y}{3y^2 - 2e^{2x}}$. [4]

[illegible]

- (b) The curve passes through the point (0, 2).

Find the equation of the tangent to the curve at this point, giving your answer in the form $ax + by + c = 0$. [3]

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

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6 (a) Find $\int \left(\frac{8}{4x+1} + \frac{8}{\cos^2(4x+1)} \right) dx$. [4]

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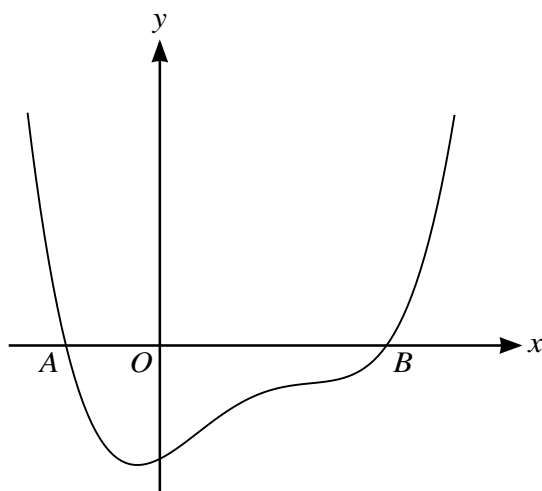
- (b)** It is given that $\int_0^{\frac{1}{2}\pi} (3 + 4 \cos^2 \frac{1}{2}x + k \sin 2x) \, dx = 10$.

Find the exact value of the constant k .

[6]

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7



A curve has equation $y = f(x)$ where $f(x) = x^4 - 5x^3 + 6x^2 + 5x - 15$. As shown in the diagram, the curve crosses the x -axis at the points A and B with coordinates $(a, 0)$ and $(b, 0)$ respectively.

- (a) Use the factor theorem to show that $(x - 3)$ is a factor of $f(x)$. [2]

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- (b) By first finding the quotient when $f(x)$ is divided by $(x - 3)$, show that

$$a = -\sqrt{\frac{5}{2-a}}. \quad [5]$$

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- (c) Use an iterative formula, based on the equation in part (b), to find the value of a correct to 3 significant figures. Give the result of each iteration to 5 significant figures. [3]

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[illegible]

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