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Cambridge Assessment International Education

Cambridge International AS & A Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

9959765408

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 $0° < \theta < 90°$. [3]

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

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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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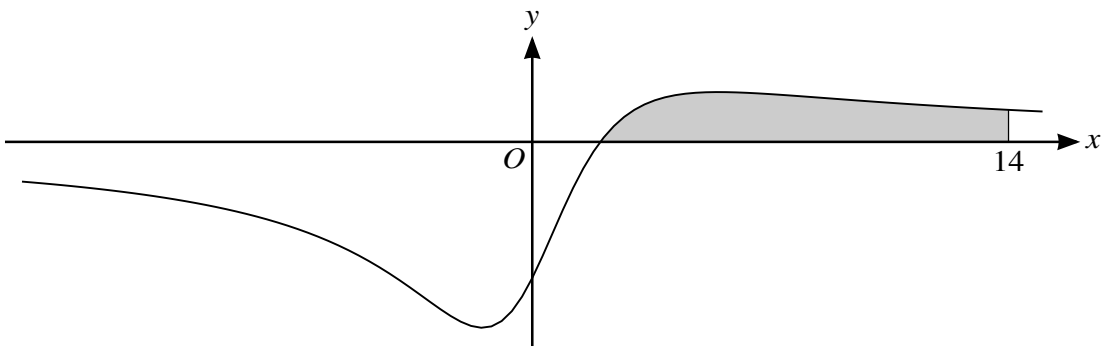
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The diagram shows the curve with equation $y = \dfrac{x-2}{x^2+8}$. The shaded region is bounded by the curve and the lines $x = 14$ and $y = 0$.

(a) Find $\dfrac{\mathrm{d}y}{\mathrm{d}x}$ and hence determine the exact x-coordinates of the stationary points. [4]

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(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]

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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]

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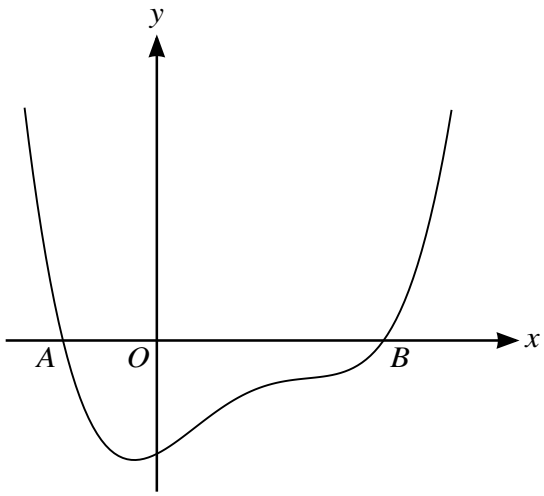
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6 **(a)** Find $\int\left(\frac{8}{4x+1}+\frac{8}{\cos^2(4x+1)}\right)\mathrm{d}x$. [4]

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

Find the exact value of the constant k. [6]

7



A curve has equation $y = \mathrm{f}(x)$ where $\mathrm{f}(x) = x^4 - 5x^3 + 6x^2 + 5x - 15$. 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 $\mathrm{f}(x)$. [2]

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

$$a = -\sqrt{\frac{5}{2 - a}}.$$ [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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Additional Page

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