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Cambridge Assessment International Education

Cambridge International AS & A Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

9462351320

MATHEMATICS **9709/15**

Paper 1 Pure Mathematics 1 **May/June 2025**

1 hour 50 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 75.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **20** pages. Any blank pages are indicated.

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1 The equation of a curve is such that $\frac{dy}{dx} = 12(2x-5)^2 + 8x$. It is given that the curve passes through the point (2, 4).

Find an equation of the curve. [4]

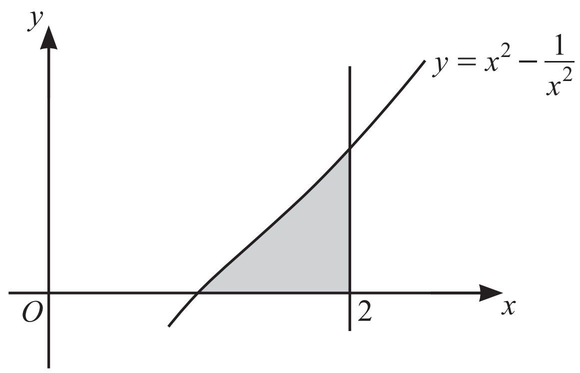
2 In the expansion of $(3+ax)^5+(6-x)^4$, the coefficient of x^2 is six times the coefficient of x.

Find the possible values of the constant a. [5]

3 **(a)** Use completing the square to find the exact solutions of the equation $4x^2 - 4x - 1 = 0$. [2]

(b) Hence solve the equation $4\tan\theta = 4 + \dfrac{1}{\tan\theta}$ for $0° < \theta < 180°$. [3]

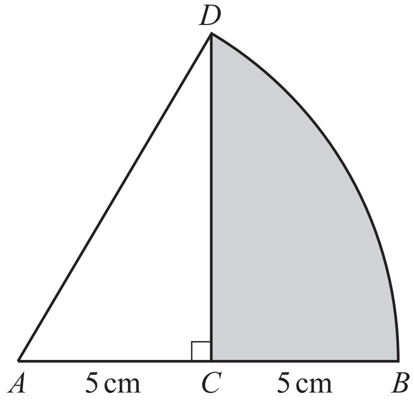
4



The diagram shows part of the curve $y = x^2 - \frac{1}{x^2}$. The shaded region is bounded by the curve, the line $x = 2$ and the x-axis.

Find the volume formed when the shaded region is rotated through 360° about the x-axis, giving your answer correct to 2 decimal places. [5]

5



The diagram shows a sector ABD of a circle with centre A and radius 10 cm. The perpendicular bisector of AB passes through D.

(a) Find the perimeter of the shaded region BCD, giving your answer correct to 1 decimal place. [4]

(b) Find the area of the shaded region *BCD*, giving your answer correct to 1 decimal place. [2]

6 Each year, on her birthday, Ananya receives some money from each of her parents.

On Ananya's first birthday, her father gives her \$10. Every subsequent year, her father gives her \$5 more than he gave her the previous year.

On Ananya's first birthday, her mother also gives her \$10. Every subsequent year, her mother gives her 20% more than she gave her the previous year.

(a) Show that on Ananya's eleventh birthday she receives more from her mother than from her father. [3]

(b) Find the total amount of money Ananya receives up to and including her eighteenth birthday. [5]

7 In the parallelogram $ABCD$, the coordinates of A are (3, 7), the coordinates of B are (6, p) and the coordinates of D are (1, p). It is given that the gradient of AB is $-\frac{2}{3}$.

(a) Find the value of p. [2]

(b) Find the coordinates of C. [2]

(c) Find the area of the triangle formed by the perpendicular bisector of AB and the x- and y-axes. [5]

8 The equation of a curve is $y = x^3 + ax^2 + bx + 5$. The curve has a stationary point at (1, 9).

(a) Find the values of the constants a and b. [5]

(b) Find the coordinates of the other stationary point. [3]

(c) A point P is moving along part of the curve in such a way that the y-coordinate of P is increasing at a constant rate of 6 units per second.

Find the rate at which the x-coordinate of P is increasing when $x = 5$. [3]

9 Functions f and g are defined as follows.

$$f(x) = \cos x \text{ for } 0 \leqslant x \leqslant \pi$$
$$g(x) = 3\cos(x - \pi) + 2 \text{ for } \pi \leqslant x \leqslant 2\pi$$

(a) Describe fully the transformations that have been combined to transform the graph of $y = f(x)$ to the graph of $y = g(x)$. [4]

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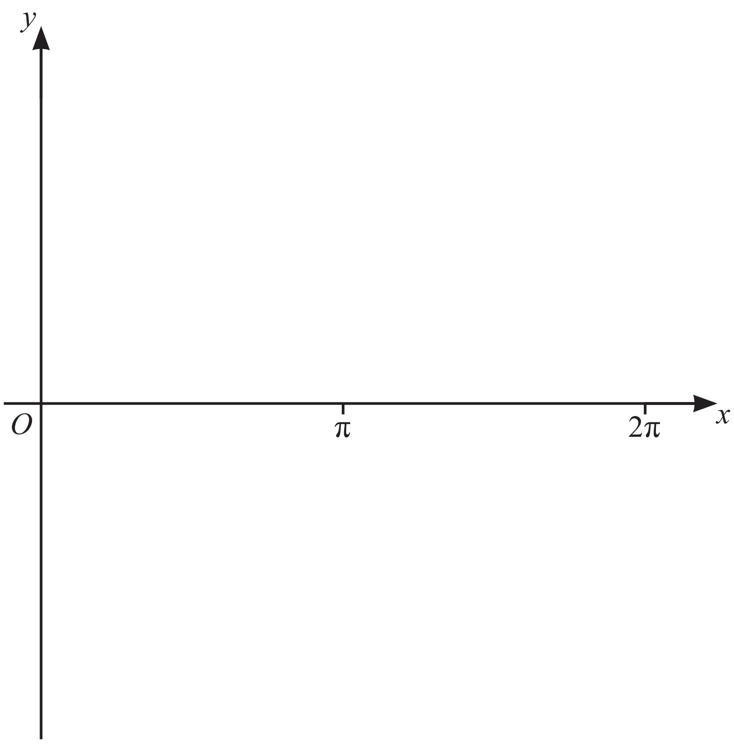
(b) On the given axes, sketch the graphs of $y = f(x)$ and $y = g(x)$. [4]



(c) Find $g^{-1}f\left(\frac{1}{3}\pi\right)$. [4]

(d) Explain why the composite function fg cannot be formed. [1]

10 The equation of a circle is $x^2 + y^2 + 4x - 8y - 12 = 0$.

(a) Find an equation of the tangent to the circle at the point (2, 8), giving your answer in the form $ax + by + c = 0$. [4]

(b) Given that the line $x + 3y = k$ does **not** intersect the circle, show that $k^2 - 20k - 220 > 0$. [5]

Additional page

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

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