



Cambridge International AS & A Level

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MATHEMATICS

9709/13

Paper 1 Pure Mathematics 1

October/November 2024

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.



■

[3]

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2 Find the exact solution of the equation

$$\cos \frac{1}{6} \pi + \tan 2x + \frac{\sqrt{3}}{2} = 0 \text{ for } -\frac{1}{4} \pi < x < \frac{1}{4} \pi. \quad [2]$$

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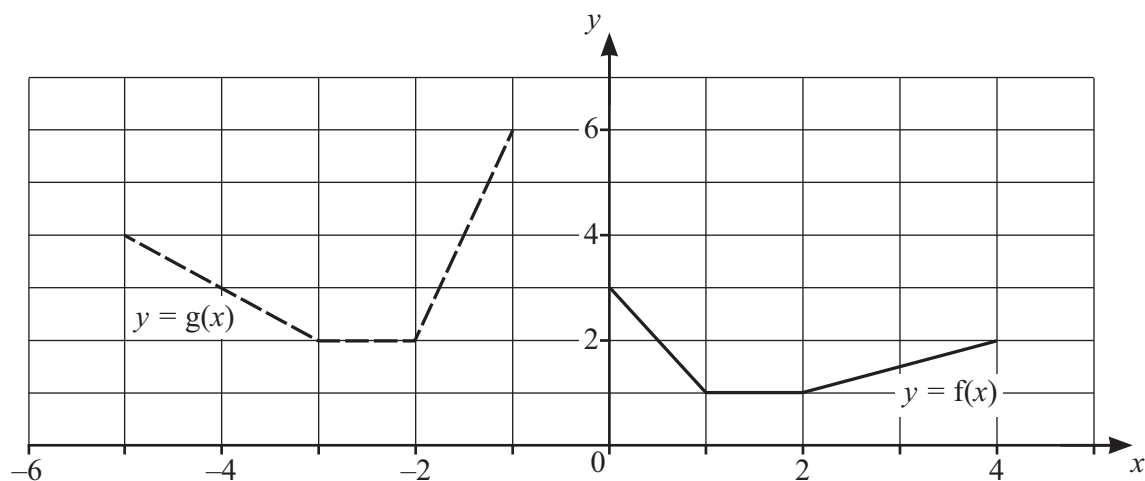
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4 Solve the equation $4\sin^4\theta + 12\sin^2\theta - 7 = 0$ for $0^\circ \leq \theta \leq 360^\circ$.

[4]





In the diagram, the graph with equation $y = f(x)$ is shown with solid lines and the graph with equation $y = g(x)$ is shown with broken lines.

- (a) Describe fully a sequence of three transformations which transforms the graph of $y = f(x)$ to the graph of $y = g(x)$. [6]

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- (b) Find an expression for $g(x)$ in the form $af(bx + c)$, where a , b and c are integers. [2]

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- 6 The first term of a convergent geometric progression is 10. The sum of the first 4 terms of the progression is p and the sum of the first 8 terms of the progression is q . It is given that $\frac{q}{p} = \frac{17}{16}$.

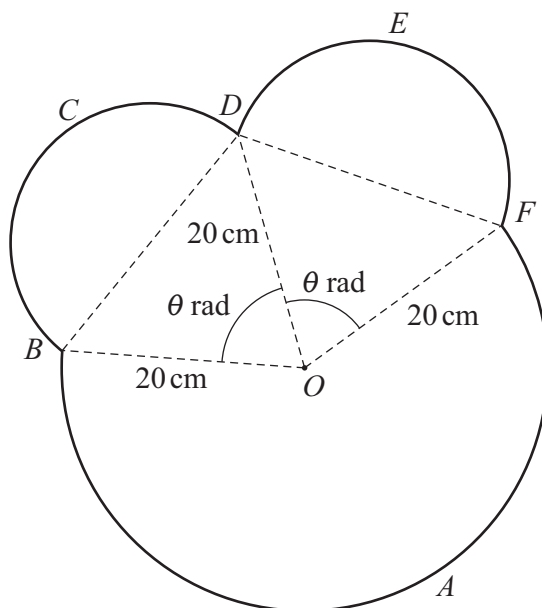
Find the two possible values of the sum to infinity. [5]

[illegible]



7

8



The diagram shows a metal plate $ABCDEF$ consisting of five parts. The parts BCD and DEF are semicircles. The part $BAFO$ is a sector of a circle with centre O and radius 20 cm, and D lies on this circle. The parts OBD and ODF are triangles. Angles BOD and DOF are both θ radians.

- (a) Given that $\theta = 1.2$, find the area of the metal plate. Give your answer correct to 3 significant figures. [5]

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- (b) Given instead that the area of each semicircle is $50\pi \text{ cm}^2$, find the exact perimeter of the metal plate. [5]





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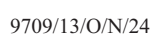
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(c) Find an expression for $f^{-1}(x)$. [3]

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(d) Hence or otherwise solve the equation $ff(x) = 29$.

[3]





A Cartesian coordinate system with a horizontal x-axis and a vertical y-axis. The origin is labeled 'O'. Two cubic functions are plotted:

- The first curve is labeled $y = x^3 - 3x + 3$. It has a local maximum in the second quadrant and a local minimum in the first quadrant.
- The second curve is labeled $y = 2x^3 - 4x^2 + 3$. It has a local maximum in the first quadrant and a local minimum in the second quadrant.

The two curves intersect at the origin (0,0) and at another point in the first quadrant. The region between the two curves, starting from the origin and ending at their second intersection point, is shaded in light blue.

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(b) Find the area of the shaded region.

[4]

[illegible]



- [4]

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(b) Find the two possible equations of the circle.

[5]

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- (c) Points A and B on the curve have x -coordinates 0.25 and 1 respectively. For a different value of k , the tangents to the curve at the points A and B meet at a point with x -coordinate 0.6.

Find this value of k .

[6]

[illegible]



Additional page

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Lined area for writing answers, consisting of multiple horizontal dotted lines.

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