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CAMBRIDGE
International Education

Cambridge International AS & A Level

MATHEMATICS **9709/12**

Paper 1 Pure Mathematics 1 **May/June 2026**

1 hour 50 minutes

4993659751

You must answer on the answer booklet.

You will need: Answer booklet
List of formulae (MF19)

INSTRUCTIONS

- Answer **all** questions.
- Write your answers on the answer booklet. Follow the instructions on the front cover of the answer booklet. If you need additional answer paper, ask the invigilator for a continuation booklet.
- 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 **4** pages.

DC (CE/TC) 379144/7 **R**
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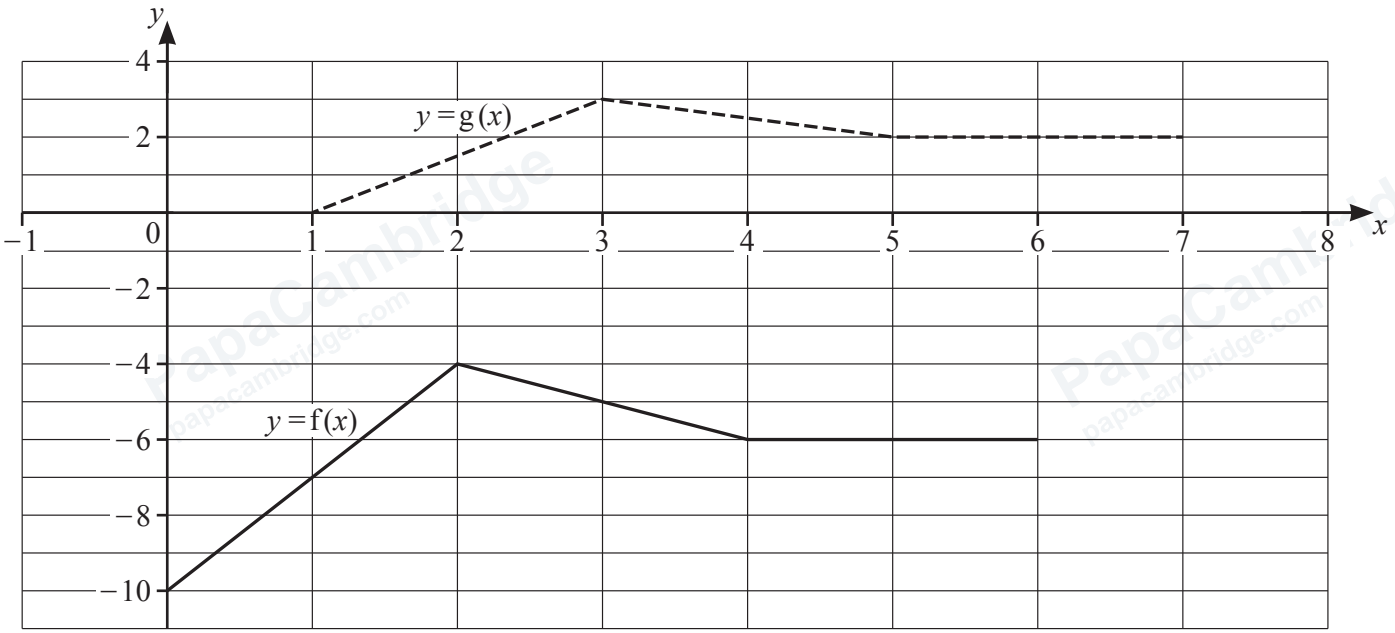
[Turn over

1 Solve the equation

$$3x^2 - 8 - \frac{16}{x^2} = 0.$$ [3]

2



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

(a) Describe fully a sequence of transformations which transforms the graph of $y = \mathrm{f}(x)$ to the graph of $y = \mathrm{g}(x)$. You should make clear the order in which the transformations are applied. [5]

(b) Find an expression for $\mathrm{g}(x)$ in the form $a\mathrm{f}(x+b)+c$, where a, b and c are constants. [2]

3 The perpendicular bisector of the line joining (4, 3) and (−2, 6) meets the line $x - 4y - 4 = 0$ at the point P.

Find the coordinates of P. [6]

4 **(a)** **(i)** Find the first three terms, in ascending powers of x, in the expansion of $\left(3 - \frac{1}{2}x\right)^4$. [2]

(ii) Find the first three terms, in ascending powers of x, in the expansion of $(2+ax)^3$. Give your answer in terms of the constant a. [1]

(b) It is now given that the coefficient of x^2 in the expansion of $\left(3 - \frac{1}{2}x\right)^4 (2+ax)^3$ is -108.

Find the value of a. [4]

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5 The equation of a curve is such that $\frac{d^2y}{dx^2} = 6x^2 + p$, where p is a constant. The curve has minimum points at (2, 3) and (−2, 3).

Find the coordinates of the other stationary point of the curve. [7]

6 Solve the equation

$$\cos^{-1}\left(\sin^2 x + \tfrac{3}{2}\sin x\right) = \tfrac{2}{3}\pi$$

for $0 \leqslant x \leqslant 2\pi$. [4]

7 **(a)** The second, fourth and last terms of an arithmetic progression are 60, 52 and −28 respectively.

Find the sum of all of the terms in the progression. [4]

(b) The second, third and fourth terms of a geometric progression are 9, $k+4$ and k^2 respectively, where k is a negative constant.

(i) Find the value of k. [3]

(ii) Find the sum to infinity of the progression. [3]

8 A diameter of a circle has end-points at (−2, 4) and (8, 8).

(a) Find an equation of the circle. [4]

(b) The line with equation $y = x + 6$ intersects the circle at the points P and Q.

Find the exact distance PQ. Give your answer in the form $a\sqrt{b}$, where a and b are both integers greater than 1. [7]

Questions 9 and 10 are on the back page.

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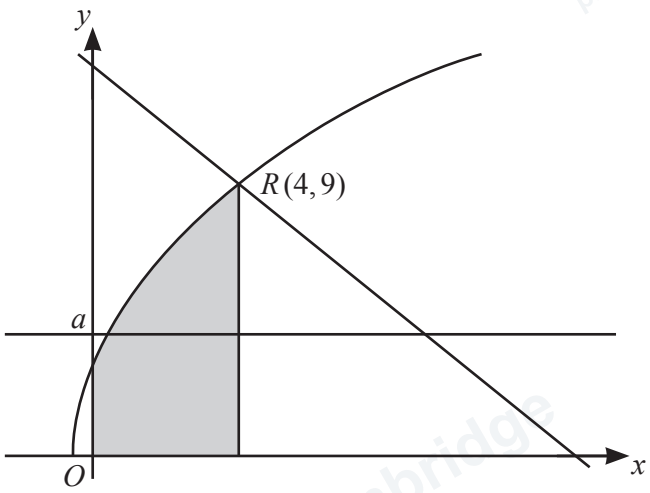
9



The diagram shows the curve with equation $y = 3\sqrt{2x+1}$, the normal to the curve at the point $R(4, 9)$ and the line $y = a$, where a is a positive constant.

(a) Find the area of the shaded region. [4]

(b) Find the exact value of a for which the triangular area enclosed by the y-axis, the normal to the curve at R and the line $y = a$ is equal to the area found in **9(a)**. [7]

10 A function f is defined by

$$\mathrm{f}(x) = px^2 - 2x + p + 4$$

for $x \in \mathbb{R}$, where p is a constant.

(a) Find the exact values of p for which the equation $\mathrm{f}(x) = 0$ has repeated roots. [3]

A function g is defined by

$$\mathrm{g}(x) = px^2 - 2x + p + 4$$

for $x \geqslant a$, where p and a are positive constants.

(b) (i) Show that the least value of a for which the function g^{-1} exists is $\frac{1}{p}$. [2]

(ii) Given that $p = 2$ and g^{-1} does exist, find an expression for $\mathrm{g}^{-1}(x)$. [4]

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