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CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

* 4 7 4 5 5 8 5 9 3 6 *

MATHEMATICS **9709/11**

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

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. Do **not** use correction fluid or tape.
- 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 In a geometric progression, the third term is 50 and the fifth term is 12.5.

Given that the common ratio of the progression is positive, find the sum to infinity of the progression. [4]

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2 **(a)** Find the expansion of each of the following expressions, in ascending powers of x, up to and including the term in x^2.

(i) $(1+2x)^5$ [2]

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(ii) $(3+x^2)^6$ [1]

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(b) Hence, find the coefficient of x^2 in the expansion of $(1+2x)^5(3+x^2)^6$. [2]

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3 The curve with equation $y = x^3$ is stretched with scale factor 4 in the x-direction and then translated by $\begin{pmatrix} 5 \\ -2 \end{pmatrix}$.

Find the equation of the transformed curve. You do not need to simplify your answer. [3]

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4 Solve the equation

$$8\sin^4\theta - 6\cos^2\theta + 1 = 0$$

for $0 \leqslant \theta \leqslant 2\pi$. [5]

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5 The equation of a curve is

$$y = -\frac{1}{2}x + \sqrt{x^3 - 3x - 2}.$$

Find an equation of the normal to the curve at the point $(6, 11)$. Give your answer in the form $ax + by + c = 0$, where a, b and c are integers to be found. [5]

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6 The 10th, 11th and 12th terms of two different arithmetic progressions are $p+6$, $4p$ and p^2 respectively.

Find the difference between the 20th terms of the two progressions. [6]

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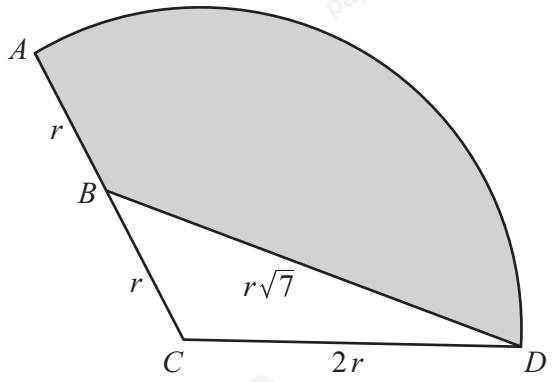

The diagram shows a sector ACD of a circle with centre C and radius $2r$. The midpoint of AC is B. The length of BD is $r\sqrt{7}$.

(a) Find the exact perimeter of the shaded region. Give your answer in terms of π and r. [4]

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(b) Find the exact area of the shaded region. Give your answer in terms of π and r. [4]

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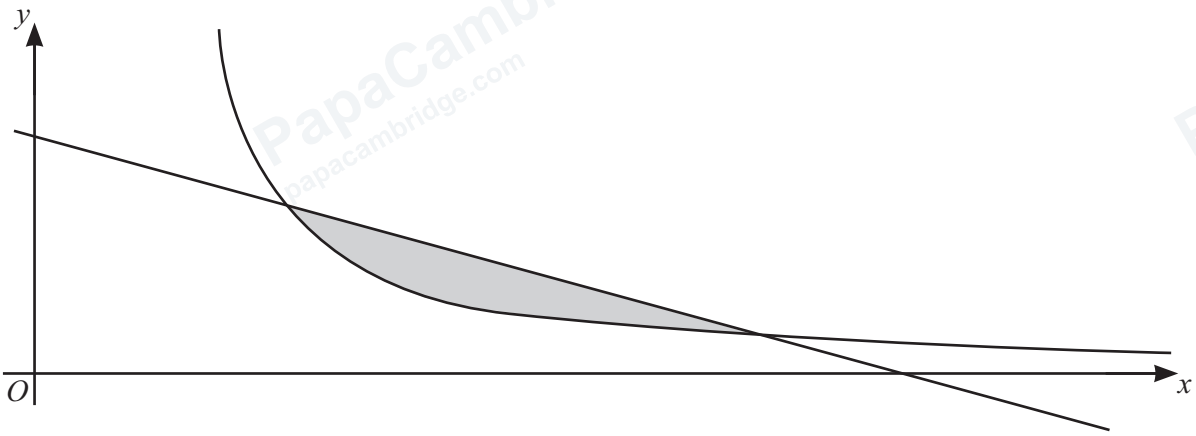

The diagram shows part of the curve with equation $y = \frac{5}{2x-1}$ and the line $y = 7 - 2x$.

Find the exact volume formed when the shaded region is rotated through 360° about the x-axis. [8]

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9 Functions f and g are defined by

$$\mathrm{f}(x) = x - 3 \qquad \text{for } x \in \mathbb{R},$$

$$\mathrm{g}(x) = x^3 - 8a \qquad \text{for } x \in \mathbb{R},$$

where a is a positive constant.

(a) Find an expression for $\mathrm{g}^{-1}(x)$. [2]

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(b) It is given that $\mathrm{gf}(-1) + 20a^2 = 0$.

(i) Find the value of a. [4]

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(ii) Find the set of values of the constant k for which the equation $\mathrm{gf}(x) = \mathrm{fg}(x) + k$ has no real solutions. [5]

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10 The equation of a curve is such that $\frac{d^2y}{dx^2} = 3x^2 - 6$. The point $P(2, 3)$ is a stationary point on the curve.

(a) By evaluating $\frac{d^2y}{dx^2}$ at P, determine the nature of this stationary point. [1]

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(b) Find the equation of the curve. [5]

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(c) (i) Find the exact x-coordinates of any other stationary points. You may use the relationship $x^3-(k+4)x+2k \equiv (x-2)(x^2+2x-k)$ if necessary. [3]

(ii) Determine the nature of these stationary points. [2]

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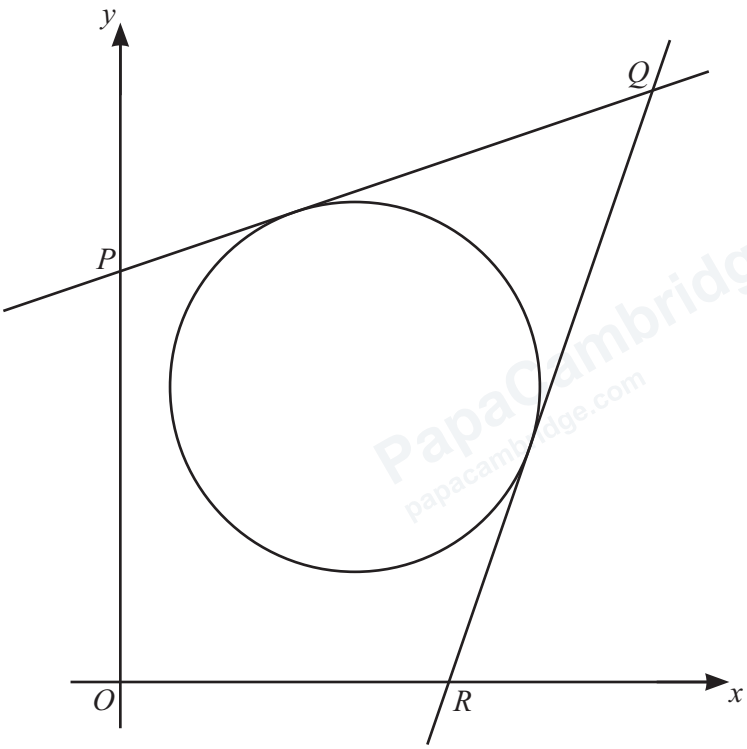

The diagram shows a circle with equation

$$(x-8)^2+(y-10)^2=40.$$

The tangent to the circle at the point $(6, 16)$ meets the y-axis at the point P. The tangent to the circle at the point $(14, 8)$ meets the x-axis at the point R. The two tangents meet at the point Q.

Find the exact area of the quadrilateral $OPQR$. [9]

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