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MATHEMATICS

9709/13

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 **16** pages. Any blank pages are indicated.





- 1 (a) Find the coordinates of the points of intersection of the curve $y = 3x^2 - 12x + 17$ and the line $y = 6x + 2$.

[4]

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- (b) Hence, solve $6x + 2 \geq 3x^2 - 12x + 17$.

[1]

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2 (a) Express $x\sqrt{x}$ in the form x^n , where n is a rational number. [1]

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(b) Hence, solve the equation

$$x^3 - 9x\sqrt{x} + 8 = 0. \quad [3]$$

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3 (a) Prove the identity

$$\frac{1}{\cos \theta} - \cos \theta \equiv \tan \theta \sin \theta. \quad [3]$$

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(b) Hence, solve the equation

$$\frac{2}{\cos \theta} - 2 \cos \theta = \tan \theta$$

for $0^\circ \leq \theta \leq 360^\circ$. [4]

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4 The equation of a curve is

$$y = 3x - kx^3 + 4,$$

where k is a constant. The point P on the curve has x -coordinate 1. The normal to the curve at P is parallel to the straight line $3y = x$.

(a) Find the value of k .

[3]

[illegible]

(b) The point Q is also on the curve. The normal to the curve at Q is also parallel to the line $3y = x$.

Find the coordinates of the point Q .

[4]

[illegible]

- 5 (a) Find the first four terms, in ascending powers of x , in the expansion of $(2 + 3x)^5$. [3]

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- (b) Hence, find the expansion up to and including the term in x^3 of $(1 - 3x)(2 + 3x)^5$. [2]

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- (c) Use your answer to **5(b)**, with a suitable value of x , to find an approximation to 0.97×2.03^5 . Write down your answer to 5 decimal places. [3]

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6 The function f is defined by $f(x) = \frac{16}{x^3} + 3x + 5$ for $x \neq 0$.

(a) Find the coordinates of all stationary points on the curve $y = f(x)$.

[4]

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(b) The function g is defined by $g(x) = f(x) + a$ where a is a constant. It is given that $g(-x) \equiv -g(x)$.

Find the value of a .

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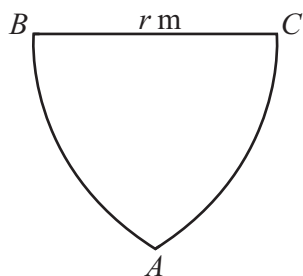
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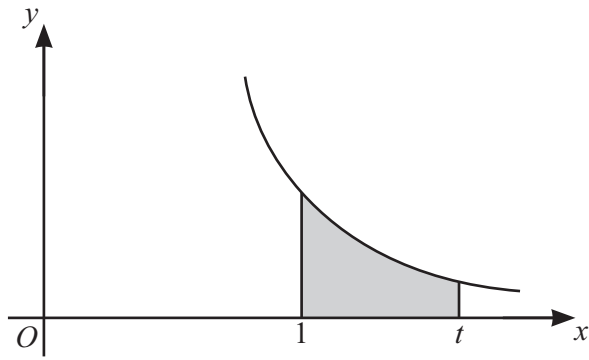
The diagram shows the design for a garden. The points A , B and C form the vertices of an equilateral triangle of side length r metres. The arcs AC and AB are parts of circles with centres B and C respectively and are both of radius r metres.

- (a) Find an expression for the perimeter of the garden. Give your answer in terms of π and r . [2]

[illegible]

- (b) Given that $r = 18$, find the exact area of the garden. Give your answer in terms of π and $\sqrt{3}$. [4]

[illegible]



The diagram shows part of the curve with equation $y = \frac{2}{5x^3}$.

The shaded region is bounded by the curve, the x -axis and the lines $x = 1$ and $x = t$. It is given that the area of the shaded region is $\frac{1}{9}$.

Find the value of t .

[5]

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9 The equation of a curve is $y = \sqrt{3x+1}$.

(a) Find $\frac{dy}{dx}$.

[2]

(b) A point P is moving along the curve such that its x -coordinate is increasing at a rate of 6 units per second.

Find the rate at which the y -coordinate of P is changing when $y = 4$.

[5]





- 10** The first, second and third terms of a geometric progression are equal to the first, fourth and sixth terms of an arithmetic progression respectively. The first term of both progressions is non-zero. The geometric progression has common ratio r .

(a) Show that

$$3r^2 - 5r + 2 = 0. \quad [3]$$

[illegible]

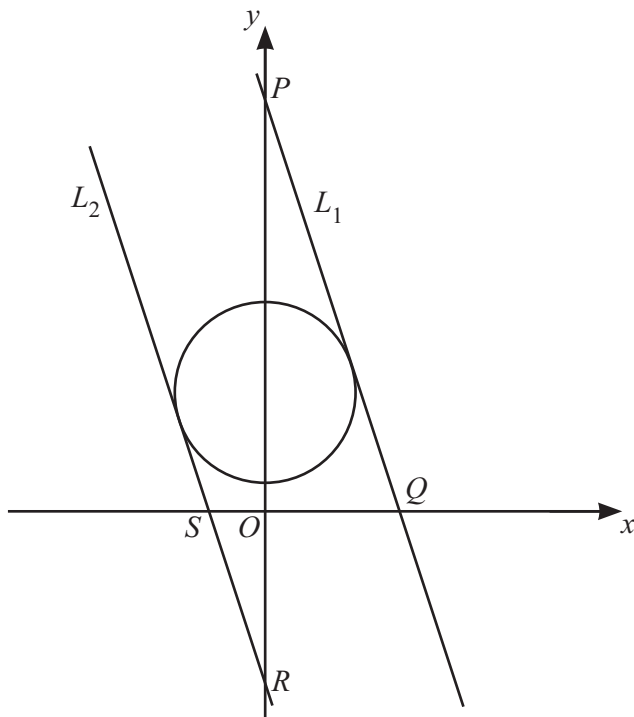


(b) It is given that the sum to infinity of the geometric progression is 54.

Find the common difference of the arithmetic progression.

[4]

[illegible]



The diagram shows a circle with two tangents, L_1 and L_2 . The tangent L_1 intersects the x -axis at Q and the y -axis at P . The tangent L_2 intersects the x -axis at S and the y -axis at R .

- (a) The end-points of a diameter of the circle are $(0, 4 - \sqrt{10})$ and $(0, 4 + \sqrt{10})$.

Show that the equation of the circle can be expressed as

$$x^2 + y^2 - 8y + 6 = 0. \quad [3]$$

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- (b) The two tangents, L_1 and L_2 , have equations of the form $y = -3x + c$.

Show that $c^2 - 8c - 84 = 0$.

[4]

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- (c) Find the exact area of quadrilateral $PQRS$.

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Additional page

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