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Newlighthouse Mock AS & A Level

CANDIDATE
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MATHEMATICS

9709/15

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 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 [].

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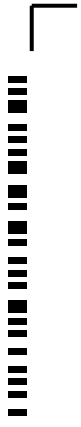
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1 (a) Find the coefficient of x^2 in the expansion of $(2 - kx)^6$ in terms of the constant k .

[2]

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(b) Given that the coefficient of x^2 in the expansion of $(1 + 3x - x^2)(2 - kx)^6$ is zero, find the possible values of k .

[3]

2 Find the set of values of m for which the line $y = mx - 2$ does not intersect the curve $y = 2x^2 - 3x + 6$. [4]

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3 (a) Show that the equation $\frac{\cos \theta}{1-\sin \theta} - \frac{\cos \theta}{1+\sin \theta} = 2 \tan \theta$ is an identity.

[3]

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(b) Hence, solve the equation $\frac{\cos \theta}{1-\sin \theta} - \frac{\cos \theta}{1+\sin \theta} = 3 \cos \theta$ for $0 \leq \theta \leq \pi$.

[4]

4 A geometric progression has first term a and common ratio r , where $a \neq 0$. An arithmetic progression has first term a and common difference d . The first three terms of the geometric progression are equal to the 1st, 3rd, and 4th terms of the arithmetic progression respectively.

(a) Show that $2r^2 - 3r + 1 = 0$. [3]

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(b) State the condition for a geometric progression to converge to infinity. Hence, justify why there is only one valid value for r and find it. [2]

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(c) Find the exact sum to infinity of this geometric progression in terms of a . [2]

5 A curve $y = f(x)$ has a local maximum at $A(-2, 5)$ and a local minimum at $B(4, -1)$.

(a) The curve $y = pf(x - q)$, where p and q are positive constants, has a local maximum at $(1, 15)$. Find the values of p and q . Hence, state the coordinates of the new local minimum. [3]

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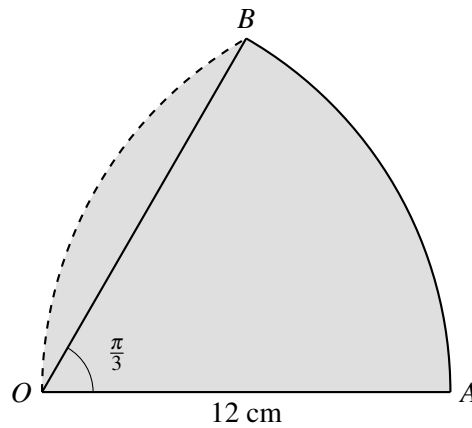
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(b) Describe fully two different types of transformations that would each map the original curve $y = f(x)$ onto a curve where the x -coordinate of the local maximum is greater than the x -coordinate of the local minimum. (Notice transformation that differ only numerically such as $f(x) + 1, f(x) + 2$ are considered the same) [2]



The diagram shows a sector OAB of a circle with centre O and radius 12 cm. The angle AOB is $\frac{\pi}{3}$ radians. An arc of a circle with centre A and radius 12 cm is drawn from O to B , cutting inwards into the sector. The shaded region is bounded by the straight line OA , the arc AB , and the arc OB .

- (a) Show that the exact perimeter of the shaded region is $12 + 8\pi$. [3]

- (b) Find the exact area of the shaded region, giving your answer in the form $c\pi + d\sqrt{3}$, where c and d are constants to be found. [4]

7 Functions f and g are defined by

$$f(x) = x^2 - 4x + 7 \quad \text{for } x \geq k,$$

$$g(x) = 2x + 1 \quad \text{for } x \in \mathbb{R}.$$

- (a) State the smallest value of the constant k for which f is a one-one function. [1]

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- (b) Using this value of k , find the domain and range of the composite function gf . [3]

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

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8 A curve is such that $\frac{dy}{dx} = \frac{k}{\sqrt{x}} - 2$, where k is a constant. The curve has a stationary point at $x = 4$.

(a) Find the value of k and determine the nature of the stationary point.

[3]

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(b) Given that the curve passes through the point $(9, 5)$, find the equation of the curve.

[3]

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(c) A point moves along this curve. At the instant when the point passes through $x = 9$, the x -coordinate is increasing at a constant rate of 0.6 units per second. Find the rate of change of the y -coordinate at this instant.

[2]

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9 A circle C_1 has equation $x^2 + y^2 - 10x + 4y + 4 = 0$.

(a) Find the coordinates of the centre and the exact length of the radius of C_1 .

[2]

(b) The line $3x - 4y + k = 0$ is a tangent to C_1 . Find the two possible values of the constant k .

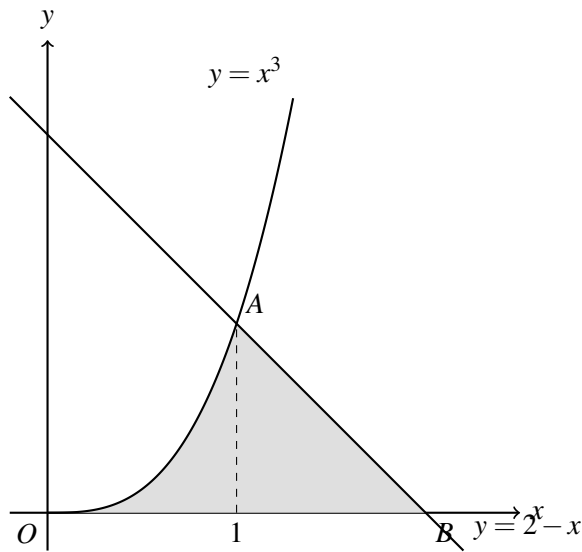
[3]

(c) Using the positive value of k , find the coordinates of the point of contact P between the line and C_1 .

[2]

(d) A second circle C_2 has the same radius as C_1 and is also tangent to the line $3x - 4y + k = 0$ at the point P . Find the equation of C_2 in the form $x^2 + y^2 + ax + by + c = 0$.

[3]



The diagram shows part of the curve $y = x^3$ and the line $y = 2 - x$. The curve and the line intersect at the point $A(1, 1)$. The line crosses the x -axis at the point B . The shaded region is bounded by the curve, the line, and the x -axis.

- (a) Find the exact area of the shaded region. [2]

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- (b) The shaded region is rotated through 360° about the x -axis. Find the exact volume of the solid generated, giving your answer in terms of π . [5]

11 A curve has equation $y = 2x^2 - 5x + 4$.

(a) Find the equation of the tangent to the curve at the point $P(2, 2)$.

[3]

(b) A straight line L has equation $y = 3x - 10$. The original curve is translated horizontally by the vector $\begin{pmatrix} p \\ 0 \end{pmatrix}$, where p is a positive constant.
Find the value of p for which the translated curve is a tangent to the line L .

[3]

(c) For this value of p , find the coordinates of the point where the translated curve touches the line L .

[2]