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ADDITIONAL MATHEMATICS**0606/13**

Paper 1 Non-calculator

May/June 2026**2 hours**

You must answer on the question paper.

No additional materials are needed.

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.
- Calculators must **not** be used in this paper.
- You must show all necessary working clearly.

INFORMATION

- The total mark for this paper is 80.
- The number of marks for each question or part question is shown in brackets [].

This document has **16** pages. Any blank pages are indicated.

List of formulas

Equation of a circle with centre (a, b) and radius r .

$$(x - a)^2 + (y - b)^2 = r^2$$

Curved surface area, A , of cone of radius r , sloping edge l .

$$A = \pi r l$$

Surface area, A , of sphere of radius r .

$$A = 4\pi r^2$$

Volume, V , of pyramid or cone, base area A , height h .

$$V = \frac{1}{3} Ah$$

Volume, V , of sphere of radius r .

$$V = \frac{4}{3} \pi r^3$$

Quadratic equation

For the equation $ax^2 + bx + c = 0$,

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Binomial theorem

$$(a + b)^n = a^n + \binom{n}{1} a^{n-1} b + \binom{n}{2} a^{n-2} b^2 + \dots + \binom{n}{r} a^{n-r} b^r + \dots + b^n,$$

where n is a positive integer and $\binom{n}{r} = \frac{n!}{(n-r)!r!}$

Arithmetic series

$$u_n = a + (n - 1)d$$

$$S_n = \frac{1}{2} n(a + l) = \frac{1}{2} n\{2a + (n - 1)d\}$$

Geometric series

$$u_n = ar^{n-1}$$

$$S_n = \frac{a(1 - r^n)}{1 - r} \quad (r \neq 1)$$

$$S_\infty = \frac{a}{1 - r} \quad (|r| < 1)$$

Identities

$$\sin^2 A + \cos^2 A = 1$$

$$\sec^2 A = 1 + \tan^2 A$$

$$\operatorname{cosec}^2 A = 1 + \cot^2 A$$

Formulas for $\triangle ABC$

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$a^2 = b^2 + c^2 - 2bc \cos A$$

$$\Delta = \frac{1}{2} ab \sin C$$



- 1 (a) Write $2x^2 - 6x + 5$ in the form $a(x + b)^2 + c$, where a , b and c are constants.

[3]

- (b) Hence or otherwise solve the inequality $2x^2 - 6x + 5 > 13$.

[3]

2 An arithmetic progression has first term a and common difference d , where $a \neq 0$ and $d \neq 0$.

- The sum of the 6th and 11th terms is 0.
- The sum of the first 6 terms is -30 .

Find the values of a and d .

[5]

3 (a) Solve the equation $\log_x 9 = \log_9 (x^4)$.

[4]





(b) Solve the equation $2^{2x-2} + 3(2^x) - 40 = 0$.

[4]

(c) Solve the equation $|x^2 + 3x - 4| = 6$.

[4]

4 The polynomial p is given by $p(x) = 4x^3 - 5x^2 - 7x + 2$.

(a) Show that $x - 2$ is a factor of $p(x)$.

[1]

(b) Write $p(x)$ as a product of linear factors.

[3]

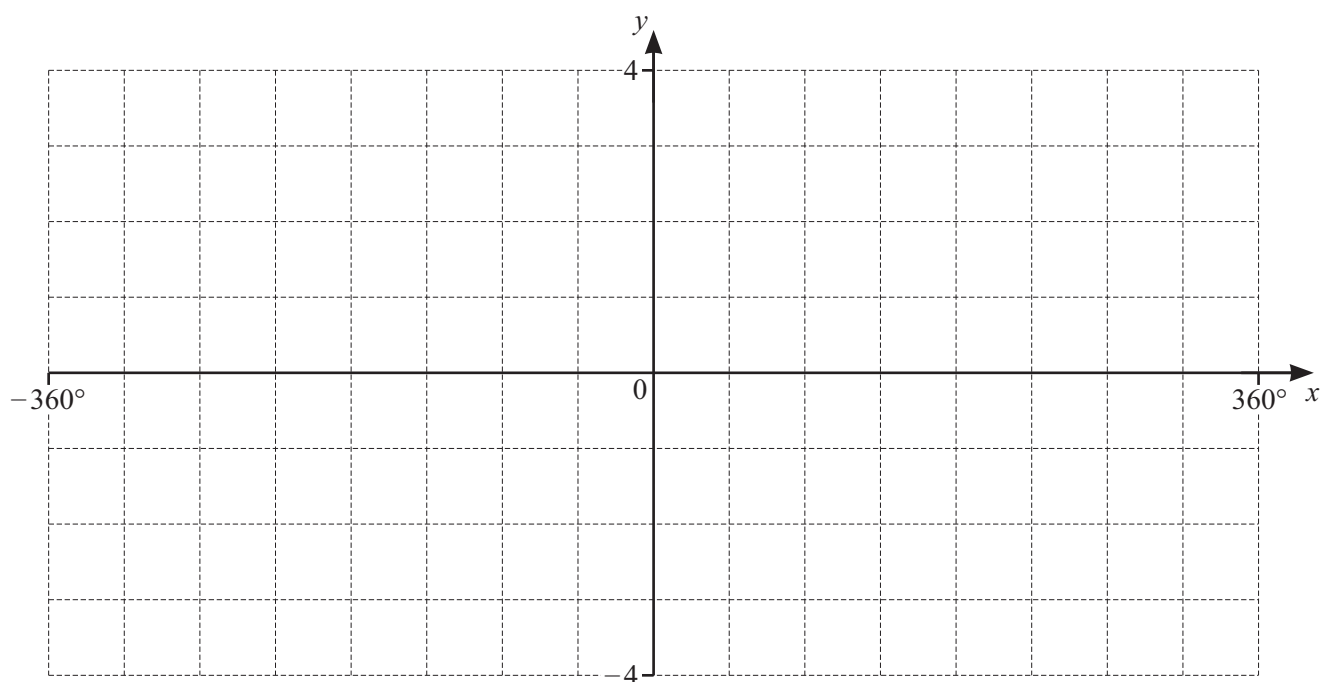
(c) Hence solve the equation $4u^6 - 5u^4 - 7u^2 + 2 = 0$.

[2]



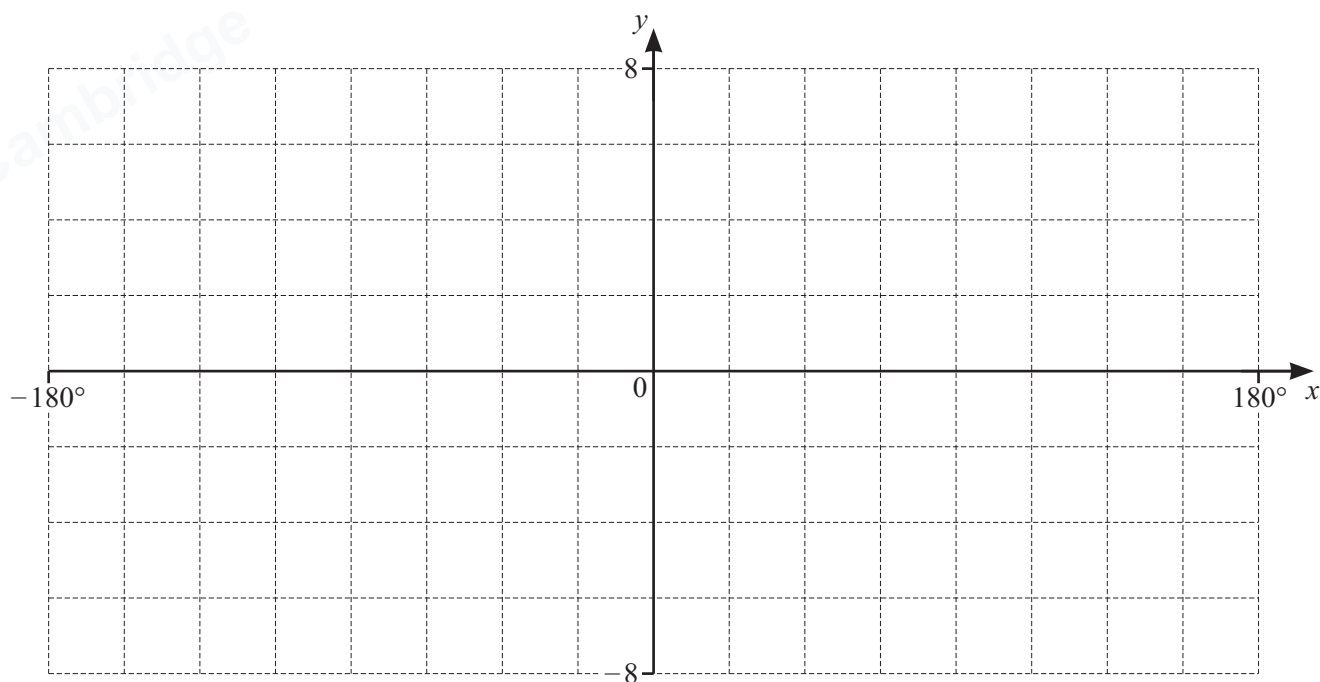
- 5 (a) On the grid, sketch the graph of $y = \cos x + 2$ for $-360^\circ \leq x \leq 360^\circ$.

[1]



- (b) On the grid, sketch the graph of $y = 4 \sin 2x$ for $-180^\circ \leq x \leq 180^\circ$.

[2]

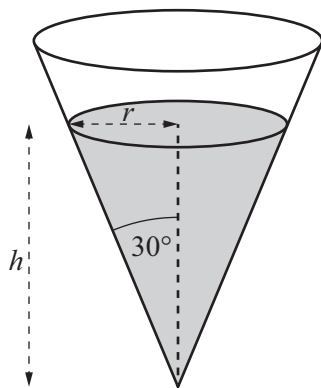


- 6 In this question time is in seconds and lengths are in centimetres.

You are given that $\cos 30^\circ = \frac{\sqrt{3}}{2}$, $\sin 30^\circ = \frac{1}{2}$ and $\tan 30^\circ = \frac{1}{\sqrt{3}}$.

A water tank is shaped as a cone with its axis vertical.

The angle between the vertical axis and the sloping edge of the cone is 30° .



At time t the depth of the water is h , the volume of water in the tank is V , and the radius of the circle formed by the surface of the water is r .

- (a) Show that $V = \frac{1}{9}\pi h^3$.

[2]

Water is flowing into the tank at a constant rate of $50 \text{ cm}^3 \text{ s}^{-1}$.

- (b) Find the rate at which h is increasing at the instant when $h = 60$.
Give your answer in terms of π .

[4]



- 7 The number of combinations of r objects out of 20 objects is $\frac{4}{3}$ times the number of combinations of $r + 1$ objects out of 20 objects.

Find the value of r .

[4]

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8 A function f is defined by $f(x) = e^{2x+1}$ for $x \in \mathbb{R}$.

(a) State the range of f^{-1} .

[1]

(b) Find the domain of f^{-1} .

[1]

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

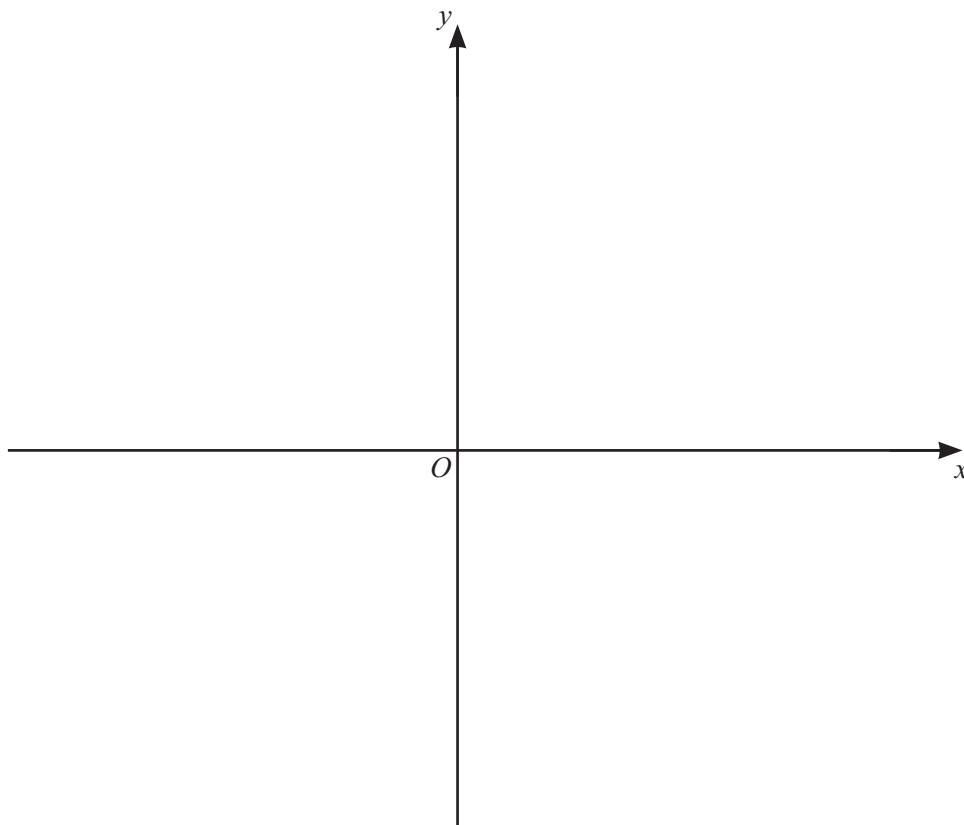
[2]

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- (d) On the axes, sketch the graph of $y = f(x)$ and hence sketch the graph of $y = f^{-1}(x)$.
State the exact coordinates of any intercepts with the axes.

[4]





- 9 A circle has centre $(3, 1)$ and radius 1.
A line has equation $2y + x = c$, where c is a constant.

(a) Given that the line is a tangent to the circle, find the two possible values of c .

[7]

- (b) When c takes a value between the two values found in 9(a), state the relationship between the line and the circle.

[1]





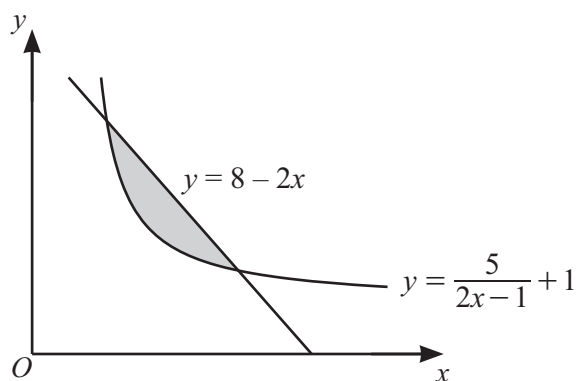
- 10 The parallelogram $OABC$ is such that $\overrightarrow{OA} = \mathbf{a}$ and $\overrightarrow{OB} = \mathbf{b}$.
 The point D lies on OB such that $OD : OB = 1 : 3$.
 The point E lies on AC such that $AE : AC = 2 : 3$.

Show that $\overrightarrow{DE}$ is parallel to $\overrightarrow{AB}$.

[5]



11



The diagram shows part of the curve $y = \frac{5}{2x-1} + 1$ and part of the line $y = 8 - 2x$.

Find the exact area of the shaded region enclosed by the curve and the line.

[10]



- 12 A curve has equation $y = e^{\frac{2a}{x}}$ where a is a positive constant.

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

[2]

The normal to the curve at the point where $x = a$ passes through the origin.

(b) Find the value of a .

[5]

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