



CANDIDATE
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0606/01

For examination from 2025

2 hours

No additional materials are needed.

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

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

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[Turn over

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 . $A = \pi rl$

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 $u_n = ar^{n-1}$
 $S_n = \frac{a(1 - r^n)}{1 - r} \quad (r \neq 1)$
 $S_\infty = \frac{a}{1 - r} \quad (|r| < 1)$

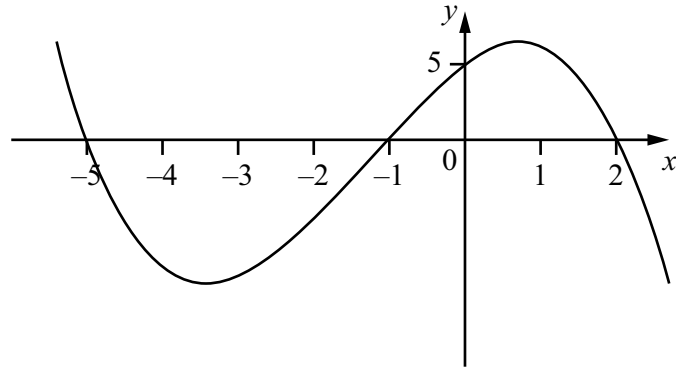
Identities $\sin^2 A + \cos^2 A = 1$
 $\sec^2 A = 1 + \tan^2 A$
 $\operatorname{cosec}^2 A = 1 + \cot^2 A$

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 The curve $y = 2x^2 + k + 4$ intersects the straight line $y = (k + 4)x$ at two distinct points. Find the possible values of k .

[4]

2



The diagram shows the graph of $y = f(x)$, where $f(x)$ is a cubic polynomial.

(a) Find $f(x)$ giving your answer as a product of linear factors. [3]

(b) Write down the values of x such that $f(x) < 0$. [2]

3 Solve the inequality $|5x + 4| \leq |2x - 3|$. [4]

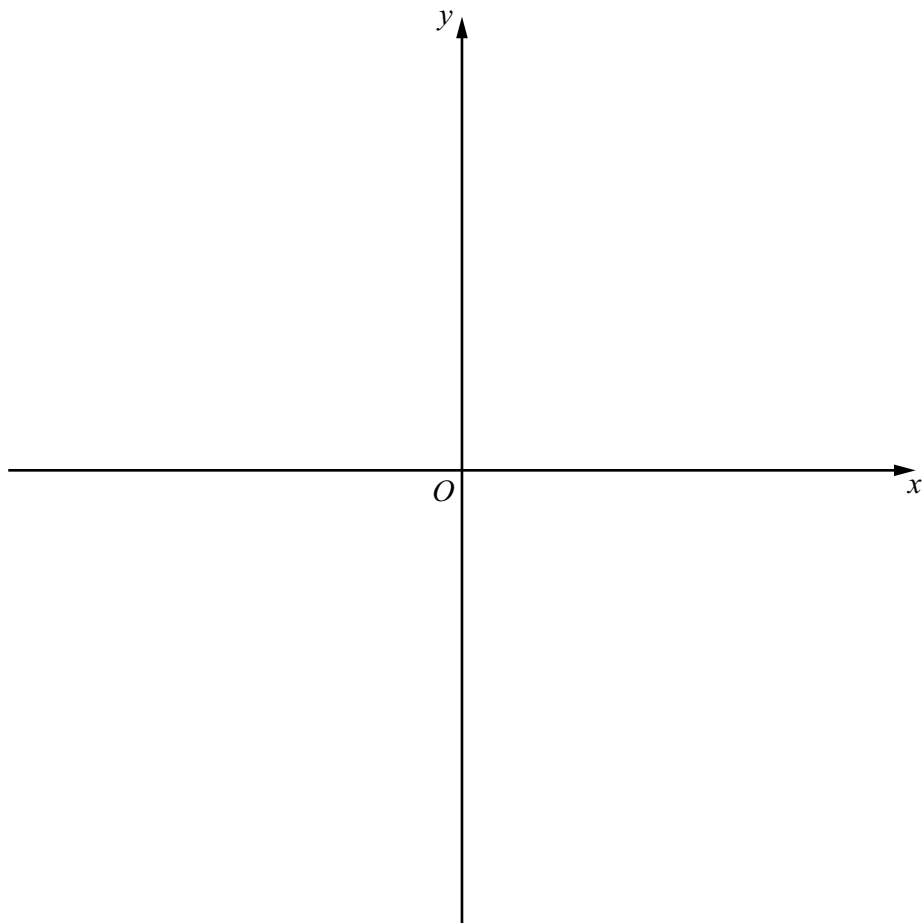
4 The function f is defined as $f(x) = x^2 + 2x - 3$ for $x \geq -1$.

(a) Given that the minimum value of $x^2 + 2x - 3$ occurs when $x = -1$ explain why $f(x)$ has an inverse. [1]

(b) On the axes below, sketch the graph of $y = f(x)$ and the graph of $y = f^{-1}(x)$.

Label each graph and state the intercepts on the coordinate axes.

[4]



5 (a) Show that $\frac{\sin x \tan x}{1 - \cos x}$ can be written as $1 + \sec x$. [4]

(b) Hence show that $\frac{d}{dx} \left(\frac{\sin x \tan x}{1 - \cos x} \right)$ can be written as $\tan x \sec x$. [2]

6 Solve the following simultaneous equations.

$$\begin{aligned}\log_3(x + y) &= 2 \\ 2\log_3(x + 1) &= \log_3(y + 2)\end{aligned}$$

[6]

- 7 When y^3 is plotted against $\ln x$, a straight-line graph is obtained. The straight line passes through the points (1, 5) and (6, 15).

(a) Find y in terms of x .

[4]

(b) Given that $y > -1$, find the corresponding values of x .

[2]

8 The polynomial $p(x) = 6x^3 + ax^2 + bx + 2$ where a and b are integers, has a factor of $x - 2$.

(a) Given that $p(1) = -2p(0)$, find the value of a and of b . [4]

(b) Using your values of a and b ,

(i) find the remainder when $p(x)$ is divided by $2x - 1$, [2]

(ii) factorise $p(x)$. [2]

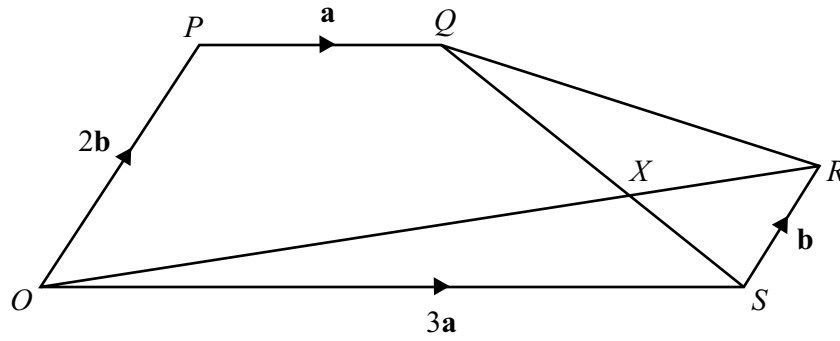
- 9 (a) Find the equation of the tangent to the curve $y = x^3 - 6x^2 + 3x + 10$ at the point where $x = 1$.
Give your answer in the form $y = mx + c$. [4]

- (b) Find the coordinates of the point where this tangent meets the curve again. [5]

10 Find the exact value of $\int_2^4 \frac{(x+1)^2}{x^2} dx$.

[6]

11



In the diagram $\vec{OP} = 2\mathbf{b}$, $\vec{OS} = 3\mathbf{a}$, $\vec{SR} = \mathbf{b}$ and $\vec{PQ} = \mathbf{a}$.
The lines OR and QS intersect at the point X .

(a) Find \vec{OQ} in terms of \mathbf{a} and \mathbf{b} . [1]

(b) Find \vec{QS} in terms of \mathbf{a} and \mathbf{b} . [1]

(c) Given that $\vec{QX} = \mu\vec{QS}$, find \vec{OX} in terms of \mathbf{a} , \mathbf{b} and μ . [1]

(d) Given that $\vec{OX} = \lambda\vec{OR}$, find \vec{OX} in terms of \mathbf{a} , \mathbf{b} and λ . [1]

(e) Find the values of λ and μ .

[3]

- 12** Circle C_1 has equation $x^2 + y^2 - 2x + 6y = 0$.
The point A lies on the circumference of the circle and has coordinates $(2, 0)$.
- (a)** Find the equation of the tangent to the circle at A . [5]

The circle C_1 is reflected in the tangent at A to form the circle C_2 .

(b) Find the equation of C_2 .

[5]

Question 13 is printed on the next page.

- 13 It is given that $2 + \cos \theta = x$ for $1 < x < 3$ and $2 \operatorname{cosec} \theta = y$ for $y > 2$. Find y in terms of x .

[4]