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ADDITIONAL MATHEMATICS

0606/22

Paper 2

February/March 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.
- You should use a scientific calculator where appropriate.
- You must show all necessary working clearly.
- 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.
- For π , use either your calculator value or 3.142.

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.

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 The function f is defined by $f(x) = 2x^2 - 6x + 4$ for all real values of x .

(a) Write $f(x)$ in the form $a(x+b)^2 + c$ where a , b and c are constants. [3]

(b) Hence find the range of f . [1]

(c) The function g is defined by $g(x) = 2x^2 - 6x + 4$ for $x \leq k$, where k is a constant.

Given that g has an inverse, state the largest possible value of k . [1]

(d) The function h is defined by $h(x) = e^{3x} - 1$ for $x \leq 0$.

Given that $gh(x)$ exists, find $gh(x)$, simplifying your answer. [3]



- 2 Points A and B have coordinates $(1, 3)$ and $(-7, 1)$.
The point P with coordinates $(2, a)$ lies on the perpendicular bisector of AB .

(a) Find the value of a .

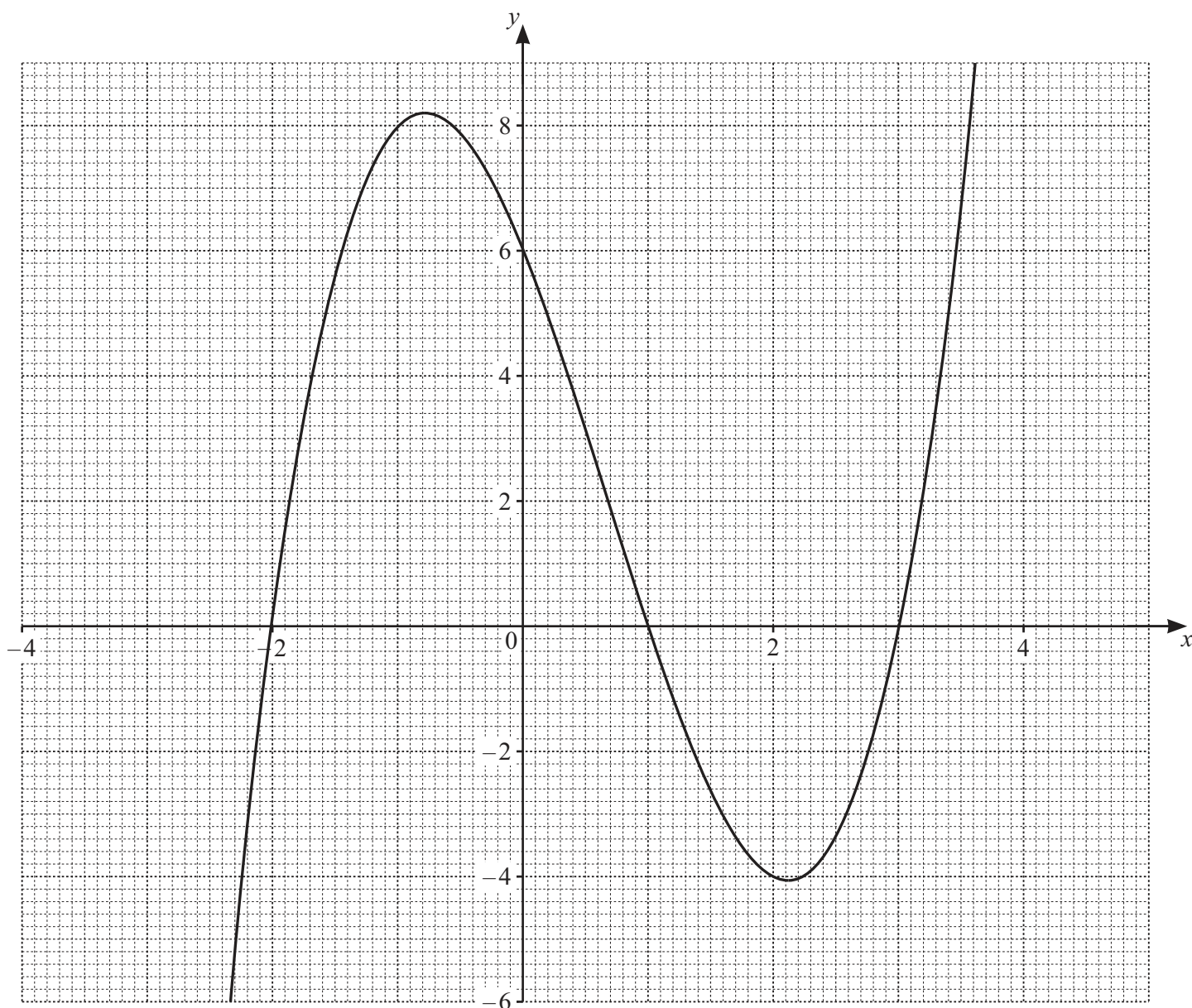
[4]

- (b) The point Q is the reflection of P in the line AB .

Find the coordinates of Q .

[2]





The diagram shows the graph of $y = (x+2)(x-1)(x-3)$.

By drawing a suitable line on the diagram, solve the inequality $(x+2)(x-1)(x-3) > 7$.

[4]



- 4 (a) A 6-digit number is to be formed from the digits 1, 2, 3, 4, 5, 6, 7, 8, 9.
No digit may be used more than once in any 6-digit number.

Find how many 6-digit numbers can be formed in the following cases.

- (i) There are no further restrictions.

[1]

- (ii) The 6-digit number includes the digit 4.

[2]

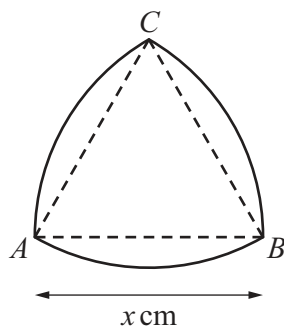
- (b) A class contains 10 girls and 12 boys.
A group of 6 students is to be selected from the class.
There must be at least 2 girls and at least 2 boys in the group.

Find the number of different selections that can be made.

[3]



- 5 The diagram shows a design for a badge.



ABC is an equilateral triangle with side x cm.

The arcs BC , CA and AB are parts of the circles with centres A , B and C respectively.

- (a) Write down the size of angle ABC in radians.
Give your answer in terms of π .

[1]

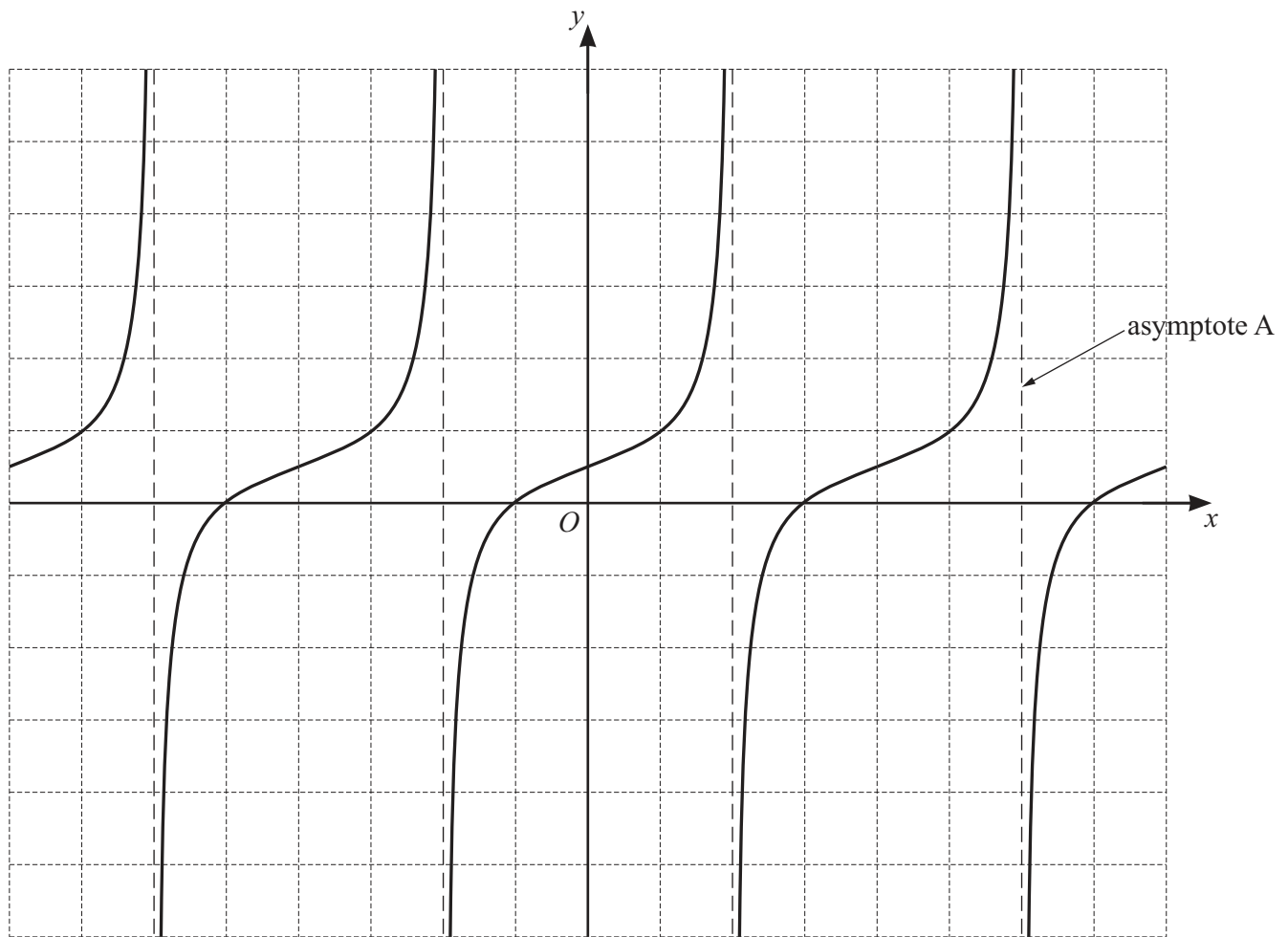
- (b) The area of the badge is $2(\pi - \sqrt{3}) \text{ cm}^2$.

Find x .

[5]



- 6 (a) The diagram shows part of the graph of $y = 1 + \tan \frac{1}{2}x$ where x is measured in degrees.



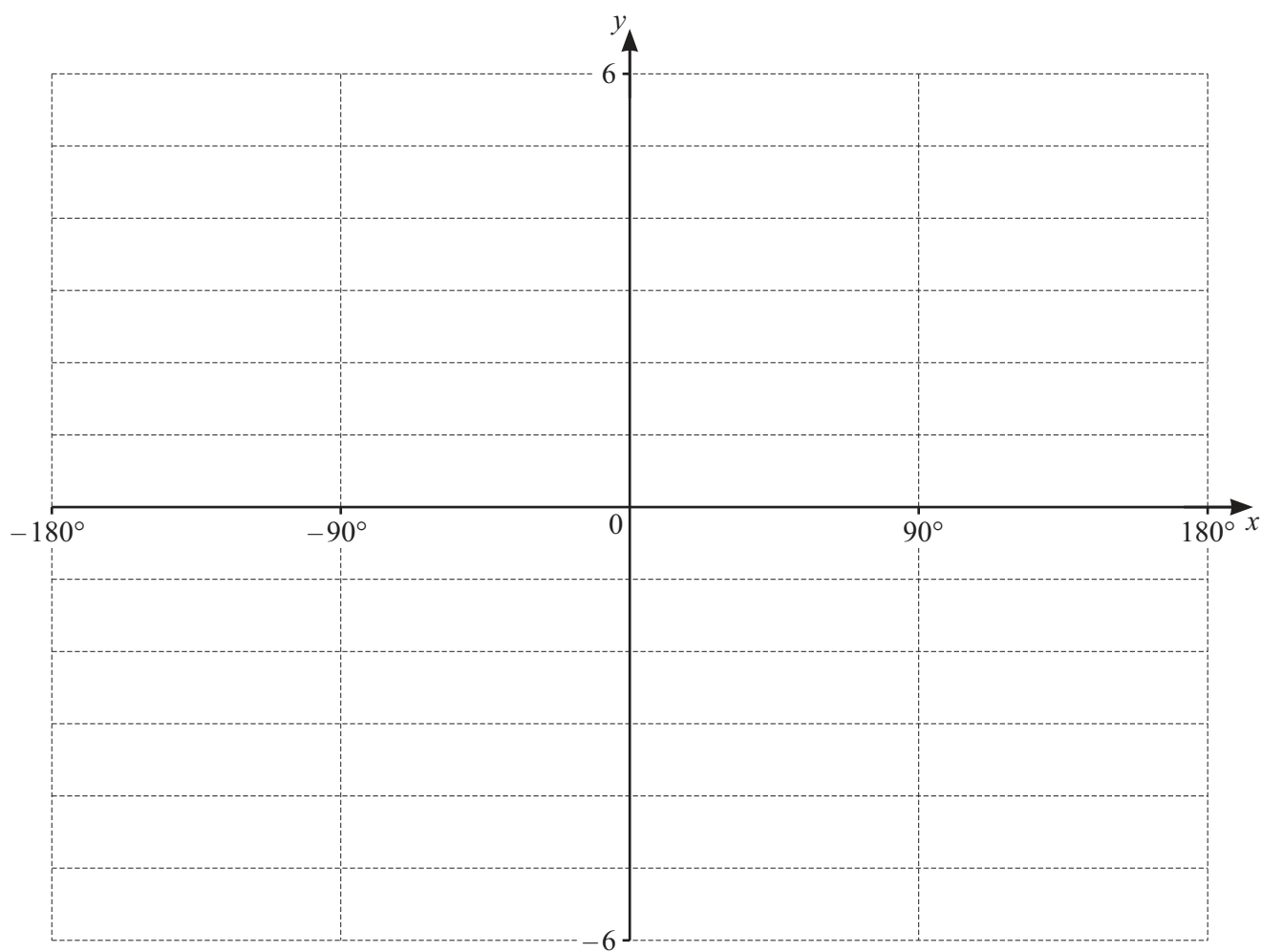
- (i) Write down the period of $1 + \tan \frac{1}{2}x$. [1]

- (ii) Write down the equation of the asymptote A. [1]



(b) On the axes below, sketch the graph of $y = 3 \cos 2x + 1$ for $-180^\circ \leq x \leq 180^\circ$.

[3]





- 7 A ship is sailing with speed $v \text{ kmh}^{-1}$.
The sailing cost per hour, $\$C$, is given by $C = v^2 + \frac{3000}{v} + 100$.

- (a) Find the speed that makes C a minimum.
Justify that this value of C is a minimum.

[5]

- (b) Hence find the minimum sailing cost for a journey of 150 km.

[3]



- 8 A circle has centre $(-2, 0)$ and radius 5.
A line has equation $y = 2x + k$, where k is a constant.
The line does **not** meet the circle.

Find the set of possible values of k .

[8]



- 9 (a) Show that $\tan \theta + \cot \theta + 2 \sec \theta$ can be written as $\frac{1+2 \sin \theta}{\sin \theta \cos \theta}$.

[3]

- (b) Hence solve the equation $\tan 2x + \cot 2x + 2 \sec 2x = 0$ for $-180^\circ \leq x \leq 180^\circ$.

[4]



- (c) Solve the equation $3 \sec(x-1) - 1 = \tan^2(x-1)$ where x is in radians and $-1 < x < 3$. [5]





10 In this question time t is in seconds and displacement s is in metres.

For $t \geq 0$, a particle moves on the positive x -axis.

At time t the acceleration of the particle is $2t - 9$.

At time $t = 7$ the velocity of the particle is 4.

(a) Find the times when the velocity of the particle is 0.

[4]

(b) At time $t = 12$, the displacement of the particle from the origin O is 150.

(i) Find an expression for the displacement of the particle at time t .

[3]



(ii) Find the distance travelled by the particle in the first 6 seconds.

[3]

Question 11 is on the back page.



- 11 (a) Find, in descending powers of x , the first three terms in the expansion of $(x^2 + \frac{1}{2x})^9$.
Give each term in its simplest form. [3]

- (b) The expansion of $(x^2 + \frac{1}{2x})^n$, where n is a positive integer, has a term that is independent of x .
Show that n is divisible by 3. [4]

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