



Essential Skills
Higher
Mathematics
Practice Exam 2026

Paper 1 (Non-calculator)

Time 1 hour and 15 minutes

Total marks – 55

Attempt ALL questions.

You may NOT use a calculator.

To earn full marks, you must show your working in your answers.

State the units for your answer where appropriate.

Use **blue** or **black** ink.

Marks available are harsh but I wanted as much course coverage as possible.

FORMULAE LIST

Circle

The equation $x^2 + y^2 + 2gx + 2fy + c = 0$ represents a circle centre $(-g, -f)$ and radius $\sqrt{g^2 + f^2 - c}$.

The equation $(x - a)^2 + (y - b)^2 = r^2$ represents a circle centre (a, b) and radius r .

Scalar product

$\mathbf{a} \cdot \mathbf{b} = |\mathbf{a}||\mathbf{b}| \cos \theta$, where θ is the angle between $\mathbf{a}$ and $\mathbf{b}$

or $\mathbf{a} \cdot \mathbf{b} = a_1 b_1 + a_2 b_2 + a_3 b_3$, where $\mathbf{a} = \begin{pmatrix} a_1 \\ a_2 \\ a_3 \end{pmatrix}$ and $\mathbf{b} = \begin{pmatrix} b_1 \\ b_2 \\ b_3 \end{pmatrix}$.

Trigonometric formulae

$$\sin(A \pm B) = \sin A \cos B \pm \cos A \sin B$$

$$\cos(A \pm B) = \cos A \cos B \mp \sin A \sin B$$

$$\sin 2A = 2 \sin A \cos A$$

$$\cos 2A = \cos^2 A - \sin^2 A$$

$$= 2 \cos^2 A - 1$$

$$= 1 - 2 \sin^2 A$$

Table of standard derivatives

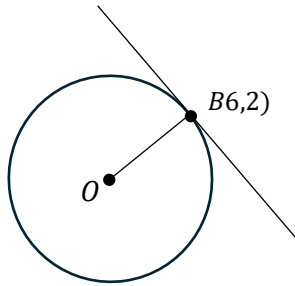
$f(x)$	$f'(x)$
$\sin ax$	$a \cos ax$
$\cos ax$	$-a \sin ax$

Table of standard integrals

$f(x)$	$\int f(x) dx$
$\sin ax$	$-\frac{1}{a} \cos ax + C$
$\cos ax$	$\frac{1}{a} \sin ax + C$

Attempt ALL questions
Total marks – 55

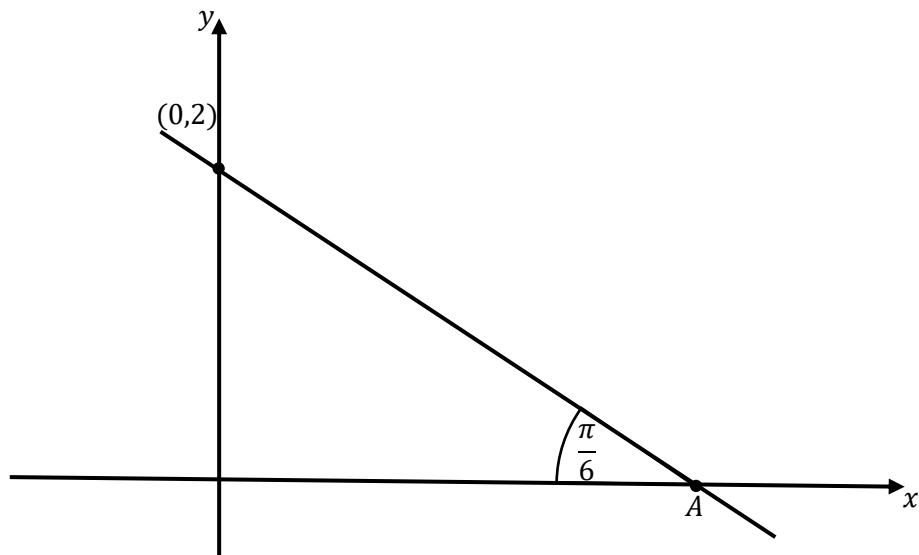
1. Point $B(6,2)$ lies on the circle $x^2 + y^2 - 6x + 4y - 12 = 0$.



Find the equation of the tangent to the circle at B .

4

2. A line passes through the point $(0, 2)$ and makes an angle of $\frac{\pi}{6}$ with the x -axis as shown.



- (a) Determine the equation of the line.
- (b) Establish the coordinates of the point A .

3

1

3. A sequence is generated by the recurrence relation

$$U_{n+1} = mU_n + c$$

The first 3 values of the sequence are 25, 15 and 11.

- (a) Find the values of m and c . 3
(b) Calculate the limit of the sequence. 2

4. The points $P(1, 2, -1)$, $Q(k, -2, 1)$ and $R(7, -10, 5)$ are collinear.

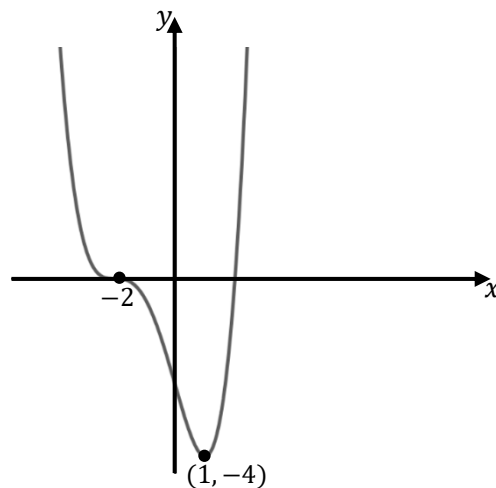
- (a) Calculate the value of k . 2
(b) State the ratio that Q divides PR . 1

5. A function, f , is defined as $f(x) = x^3 + 1$, where $0 \leq x \leq 4$.

- (a) Find the inverse function $f^{-1}(x)$. 3
(b) State the domain of $f^{-1}(x)$. 1

6. The diagram shows the graph of $y = f(x)$.

There is a minimum turning point at $(1, -4)$ and a point of inflection at $x = -2$.

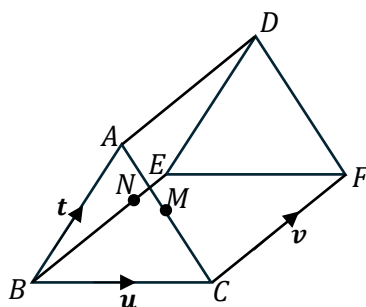


- (a) Sketch the graph of $y = 2 - f(x + 1)$. 3
(b) Sketch the graph of $y = f'(x)$. 2

7. Express $x^3 + 2x + 3$ in fully factorised form. 3
8. Given $g(x) = \cos 3x + \sin 3x$, find $g'(\frac{\pi}{2})$. 4
9. Express $2\log_a 3 + \log_a 4 - 3\log_a 2$ in the form $\log_a \left(\frac{B}{C}\right)$, where B and C are whole numbers 3
10. (a) Express $\sqrt{3}\cos x^\circ - \sin x^\circ$ in the form $k\cos(x + a)$, where $k > 0$ and $0 < a < 2\pi$. 4
- (b) Hence, or otherwise, find:
- (i) the minimum value of $y = \sqrt{3}\cos x^\circ - \sin x^\circ + 1$ 1
- (ii) determine the value of a where it occurs $0 < a < 2\pi$. 2

11. The diagram shows the triangular prism ABCDEF.

$\overrightarrow{BA} = \mathbf{t}$, $\overrightarrow{BC} = \mathbf{u}$ and $\overrightarrow{CF} = \mathbf{v}$.



- (a) Express $\overrightarrow{AC}$ in terms of $\mathbf{t}$ and $\mathbf{u}$. 1
- M is the midpoint of AC; N divides BE in the ratio 3:1.
- (b) Express $\overrightarrow{MN}$ in terms of $\mathbf{t}$, $\mathbf{u}$ and $\mathbf{v}$. 2

- 12.** The point $P(x, y)$ lies on the curve $y = 6x^2 - 2x^3$.
- (a) Find the value of x for which the gradient of the tangent at P is 6. **4**
- (b) Hence find the equation of the tangent at P . **2**
- 13.** Given that $\tan 2x = \frac{\sqrt{5}}{2}$, $0 < x < \frac{\pi}{4}$, find the exact value of:
- (a) $\cos 2x$ **1**
- (b) $\cos x$ **2**

[END OF QUESTION PAPER]