Sine/cosine graphs and symmetry

6 questions | 17 marks

Equivalent correct methods earn the corresponding marks.

1. State the amplitude, period and range of $y = 4\sin(2x) + 1$. [3 marks]

Use $|A| = 4$ and $\frac{360^\circ}{|B|} = 180^\circ$.

Add and subtract 4 from the midline 1.

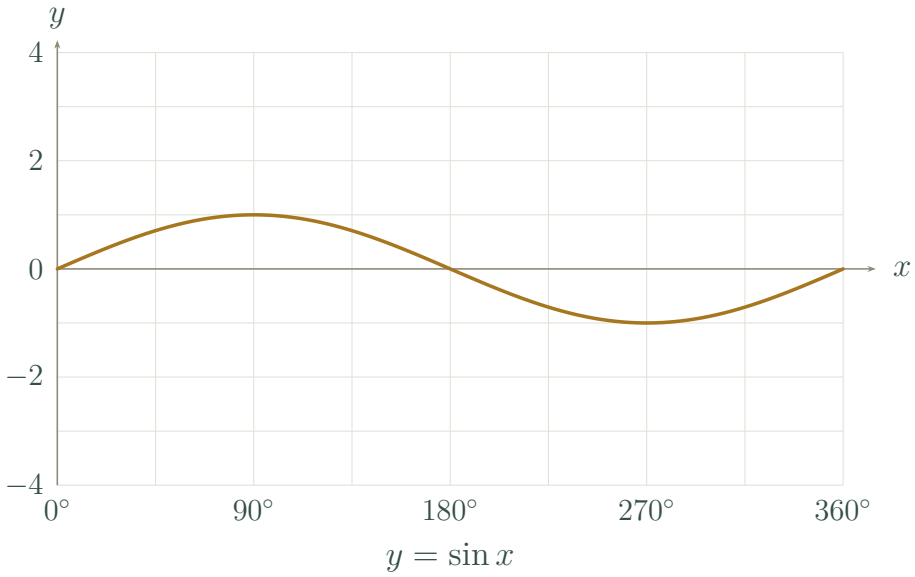
Answer: Amplitude 4; period 180°; $-3 \le y \le 5$.

2. Give $y = \cos x$ at $x = 0^\circ$, 90°, 180°, 270° and 360°. [2 marks]

Use the x-coordinates of the unit-circle points.

Answer: 1, 0, -1, 0, 1.

3. Sketch $y = \sin x$ for $0^\circ \le x \le 360^\circ$ on the supplied grid. Label the intercepts and turning points. [4 marks]



Evaluate sine at $0^\circ, 90^\circ, 180^\circ, 270^\circ, 360^\circ$.

Plot the five key points and join with a smooth periodic curve.

Answer: Intercepts $(0^\circ, 0)$, $(180^\circ, 0)$, $(360^\circ, 0)$; maximum $(90^\circ, 1)$; minimum $(270^\circ, -1)$.

4. Describe how $y = -2\cos x$ differs from $y = 2\cos x$. [2 marks]

Every y-value changes sign.

Both amplitudes are 2 and periods 360°.

Answer: It is reflected in the x-axis; amplitude and period stay the same.

5. Explain why $\sin(360^\circ - x) = -\sin x$ using the unit circle. [3 marks]

The two points have opposite vertical coordinates.

Sine is the vertical coordinate.

Answer: Reflection across the x-axis keeps x-coordinate but reverses y-coordinate.

6. A sine graph has maximum 3, minimum -1 and period 360°. It crosses its midline upwards at $x = 0^\circ$. Give a rule. [3 marks]

Midline $= \frac{3 + (-1)}{2} = 1$.

Amplitude $= \frac{3 - (-1)}{2} = 2$.

An upward midline crossing at 0° matches sine.

Answer: $y = 2\sin x + 1$.