

3.4 Sine and Cosine Function Graphs

Name: _____ Class: _____ Date: _____ Total: 9 marks

KEY WORDS period 周期 • midline 中线 • amplitude 振幅

Objective

Build the skills to answer exam questions on **sine and cosine function graphs**.

You must be able to:

- state the period, amplitude, midline, and range of $y = \sin x$ and $y = \cos x$
- relate $\cos x$ to a shifted $\sin x$

1 Worked examples

Study these first. Each one shows the method for a question type used later.

■ The basic graphs

$y = \sin x$ and $y = \cos x$ each have:

- period 2π , amplitude 1, midline $y = 0$, range $[-1, 1]$.

They are shifts of each other: $\cos x = \sin\left(x + \frac{\pi}{2}\right)$.

■ Reading a transformed graph

For $y = 3 \sin x$ the amplitude is 3, so the range is $[-3, 3]$; the period (2π) and midline ($y = 0$) are unchanged. Multiplying the whole function stretches it vertically – it does not change how often the wave repeats.

2 Practice

2.1 State the period of $y = \sin x$. [1]

2.2 State the range of $y = \cos x$. [1]

2.3 State the amplitude and midline of $y = \sin x$. [2]

3 Exam-style questions

3.1 The period of $y = \sin x$ is [1]

- | | |
|---|-----------------|
| A | π |
| B | 2π |
| C | $\frac{\pi}{2}$ |
| D | 1 |

3.2 The range of $y = \cos x$ is [1]

- | | |
|---|------------------|
| A | all real numbers |
| B | $[0, 1]$ |
| C | $[-1, 1]$ |
| D | $[-2, 2]$ |

3.3 $y = \sin x$.

- (a) State its maximum value. [1]
- (b) State its minimum value. [1]
- (c) State the smallest $x > 0$ where the maximum occurs. [1]