3.4 Sine and Cosine Function Graphs

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

KEY WORDS period • midline • amplitude

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 Key knowledge and 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]

Solutions

Each answer shows the steps, then the **result**.

2.1

- 2π

2.2

- $[-1, 1]$

2.3

- amplitude 1; midline $y = 0$

3.1 B

- 2π.

3.2 C

- $[-1, 1]$.

3.3

(a)

- 1

(b)

- -1

(c)

- $x = \frac{\pi}{2}$