

3.4 Sine and Cosine Function Graphs

Name: _____ Class: _____ Date: _____

Total: 9 marks

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]

4 Go further

- work through the **3.4 Sine and Cosine Function Graphs** lesson on the **Learn** page;
- read the **Trigonometric and Polar Functions** section of the AP Precalculus hand-out on the **Know** page.

Solutions

2.1 2π .

2.2 $[-1, 1]$.

2.3 amplitude 1; midline $y = 0$.

3.1 B.

3.2 C.

3.3 (a) 1. (b) -1 . (c) $x = \frac{\pi}{2}$.