AP PRECALCULUS • EXERCISE SHEET

3.6 Sinusoidal Function Transformations

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

Objective

Build the skills to answer exam questions on **sinusoidal function transformations**.

You must be able to:

- describe how a, b, h, and k transform $y = \sin x$

1 Worked examples

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

■ Transformations of a sinusoid

Starting from $y = \sin x$, in $y = a\sin(b(x - h)) + k$:

- a scales vertically (sets the amplitude);
- b scales horizontally (period $= \frac{2\pi}{b}$);
- h shifts horizontally;
- k shifts vertically (sets the midline).

■ Example

$y = 2\sin(x) - 3$: amplitude 2, midline $y = -3$.

2 Practice

2.1 State the effect of a in $y = a\sin x$. [1]

2.2 State the effect of k in $y = \sin x + k$. [1]

2.3 For $y = 2\sin(x) - 3$, state the amplitude and midline. [2]

3 Exam-style questions

3.1 In $y = a\sin(bx)$, increasing b [1]

- **A** raises the midline
- **B** shortens the period
- **C** raises the amplitude
- **D** shifts the graph right

3.2 The $+k$ in $y = \sin x + k$ [1]

- **A** changes the period
- **B** shifts the midline
- **C** changes the amplitude
- **D** reflects the graph

3.3 $y = 4\sin(x) + 2$.

(a) State the amplitude. [1]

(b) State the midline. [1]

(c) State the maximum value. [1]

4 Go further

- work through the **3.6 Sinusoidal Function Transformations** 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 it scales the graph vertically, setting the amplitude to $|a|$.

2.2 it shifts the graph vertically, moving the midline to $y = k$.

2.3 amplitude 2; midline $y = -3$.

3.1 B.

3.2 B.

3.3 (a) 4. (b) $y = 2$. (c) $2 + 4 = 6$.