

Vertical and Phase Shifts

ID: 8316

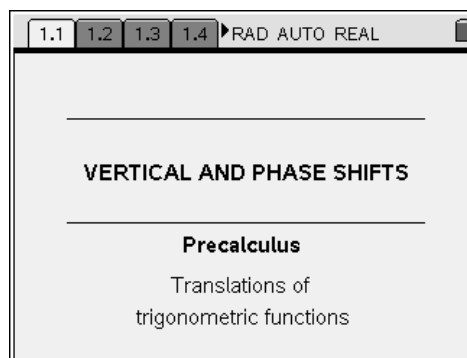
Name _____

Class _____

In this activity, you will explore:

- *Amplitude and periodic functions*
- *Vertical shift and phase shift*

Open the file *PreCalcAct03_PhaseShift_EN.tns* on your handheld, and follow along with your teacher. Use this document as a reference and to record your answers.

**Problem 1 – Amplitude and period**

On page 1.4, drag the sliders to change the values of a and b in the function $f(x) = a \sin(bx)$.

- Describe how the values of a and b affect the shape of the graph.
- What happens if a is negative?
- Complete the following statement:
For $a \neq 0$ and $b > 0$, the graph of $f(x) = a \sin(bx)$ has an amplitude of _____ and a period of _____.

Problem 2 – Vertical shift

On page 2.2, drag the slider to change the values of d in the function $f(x) = \sin(x) + d$.

- Describe how the value of d affects the shape of the graph.
- Complete the following statement:
The graph of $f(x) = \sin(x) + d$ has a vertical shift of _____.

Problem 3 – A simple phase shift

On page 3.2, drag the slider to change the values of c in the function $f(x) = \sin(x + c)$.

- Describe how the value of c affects the shape of the graph.

Problem 4 – Combining transformations

On page 4.2, drag the sliders to change a , b , c , and d in the function $f(x) = a\sin(bx + c) + d$.

- Which of the four parameters have an impact on the phase shift of the graph?
- Complete the following statement:
For $a \neq 0$ and $b > 0$, the graph of $f(x) = a\sin(bx + c) + d$ has a phase shift of _____.

Problem 5 – Bringing it all together

- For functions of the form $f(x) = a\sin(bx + c) + d$ or $g(x) = a\cos(bx + c) + d$, with $a \neq 0$ and $b > 0$, the graph has:
 - amplitude = _____
 - phase shift = _____
 - period = _____
 - vertical shift = _____

For the graphs on pages 5.4 and 5.5, find the equation of a cosine function that has the same graph as the sine function.

- $f1(x) = -1.5\sin\left(x + \frac{\pi}{4}\right) + 4$
- $f2(x) = 3\sin(2x) - 5$