



Problem 1 – Amplitude and Period

On page 1.3, click on the sliders to change the values of a and b in the function $f(x) = a \sin(bx)$. Click on the hide/show slider to show amplitude and period.

- 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, click on the slider to change the value of d in the function $f(x) = \sin(x) + d$. Click on the show/hide slider to show the horizontal line $y = d$.

- 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, click on the slider to change the value of c in the function $f(x) = \sin(x + c)$. Click on the show/hide slider to show the vertical line $x = -c$.

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



Vertical and Phase Shifts

Problem 4 – Combining Transformations

On page 4.2, click on 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 _____.

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

Problem 5 – Cosine Function

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

Problems 6 and 7– Putting It All Together

For the graph on page 6.2, find the equation of a cosine function that has the same graph as the sine function.

- $f_1(x) = -1.5 \sin\left(x + \frac{\pi}{4}\right) + 4$

For the graph on page 7.2, find the equation of a cosine function that has the same graph as the sine function.

- $f_1(x) = 3 \sin(2x) - 5$