5.5 Graphs of Sine and Cosine
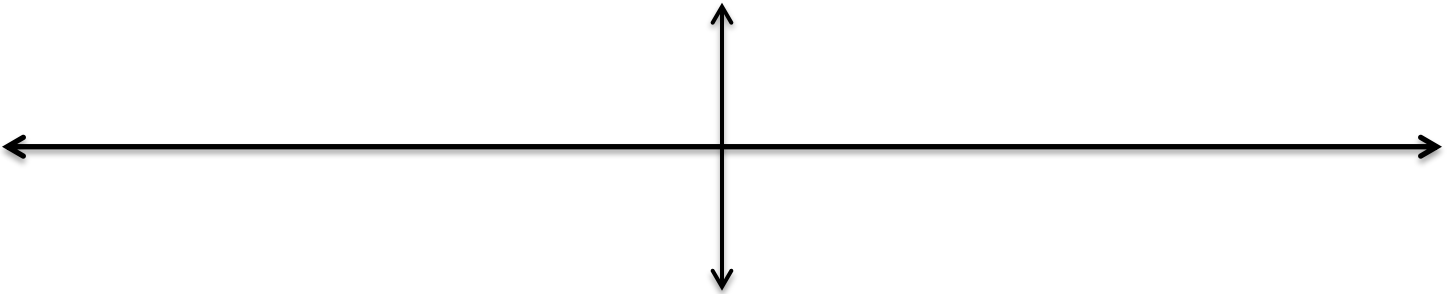
Goal 1: Graph $y = \sin x$.

a. Use the unit circle to complete a table of values for $y = \sin x$.

x																
$y = \sin x$																

b. Describe any patterns in this table.

c. Use the table to sketch $y = \sin x$ in the rectangular coordinate system for $0 \le x \le 2\pi$.

d. Describe any patterns in this sketch.

e. Prediction: Use the pattern to draw an additional cycle to the right and to the left of the first cycle. (Use a different color to sketch the additional cycles.)

f. Predict how the graph of $y = 2 \sin x$ will compare to $y = \sin x$. Then sketch one cycle of each function in the same rectangular coordinate plane for $0 \le x \le 2\pi$. (Use a different color to sketch each function.)

g. Predict how the graph of $y = \frac{1}{2} \sin x$ will compare to $y = \sin x$. Then sketch one cycle of each function in the same rectangular coordinate plane for $0 \le x \le 2\pi$. (Use a different color to sketch each function.)

h. Predict how the graph of $y = -2 \sin x$ will compare to $y = \sin x$. Then sketch one cycle of each function in the same rectangular coordinate plane for $0 \le x \le 2\pi$. (Use a different color to sketch each function.)

i. What can be said about the graphs of *sine* as the coefficient of *sine* changes?

k. Variation of y = sin x:
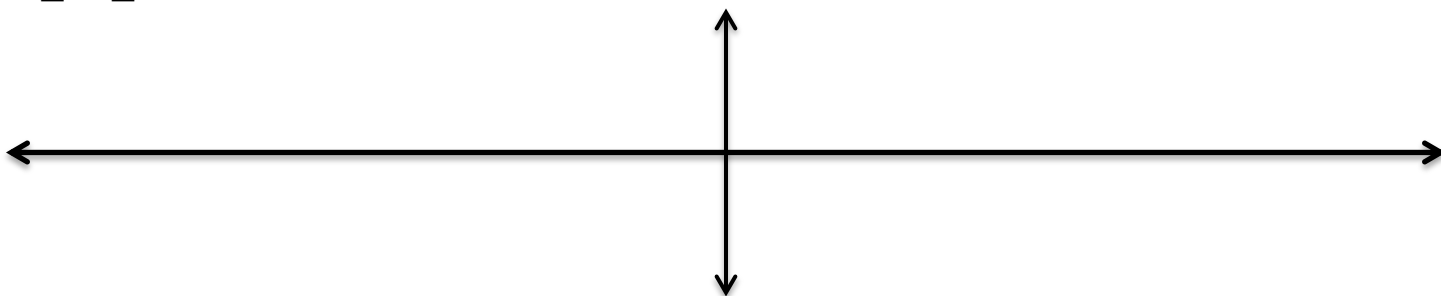
5.5 Graphs of Sine and Cosine

Goal 2: Graph $y = \cos x$.

a. Use the unit circle to complete a table of values for $y = \cos x$.

x																
$y = \cos x$																

b. Describe any patterns in this table.

c. Use the table to sketch $y = \cos x$ in the rectangular coordinate system for $0 \le x \le 2\pi$.

d. Describe any patterns in this sketch.

e. Prediction: Use the pattern to draw an additional cycle to the right and to the left of the first cycle. (Use a different color to sketch the additional cycles.)

f. Predict how the graph of $y = 2\cos x$ will compare to $y = \cos x$. Then sketch one cycle of each function in the same rectangular coordinate system for $0 \leq x \leq 2\pi$. (Use a different color to sketch each function.)

g. Predict how the graph of $y = \frac{1}{2}\cos x$ will compare to $y = \cos x$. Then sketch one cycle of each function in the same rectangular coordinate system for $0 \leq x \leq 2\pi$. (Use a different color to sketch each function.)

h. Predict how the graph of $y = -2\cos x$ will compare to $y = \cos x$. Then sketch one cycle of each function in the same rectangular coordinate system for $0 \leq x \leq 2\pi$. (Use a different color to sketch each function.)

i. What can be said about the graphs of *cosine* as the coefficient of *cosine* changes?

k. Variation of y = cos x:

l. Choose two separate colors and sketch $y = \sin x \ \text{and} \ y = \cos x$ in the same rectangular coordinate system for $0 \leq x \leq 2\pi$.

m. Compare and contrast the graphs of $y = \sin x \ \text{and} \ y = \cos x$.

n. Breathing Exercise

Goal 3: Graph sin and cosine when there is a change in the period.

a. Predict how the graph of $y = \sin 2x$ will compare to $y = \sin x$. Then sketch one period of each function in the same rectangular coordinate system x > 0. (Use a different color to sketch each function.)

b. Predict how the graph of $y = \sin \frac{1}{2}x$ will compare to $y = \sin x$. Then sketch one period of each function in the same rectangular coordinate system. For x > 0.(Use a different color to sketch each function.)

c. Compare the functions in *a* and *b*. What is the connection between the value for B and the period? How will B affect the graphs of cosine?

o. For the next class period, find a naturally occurring phenomenon that is periodic in nature and explain how sine and cosine functions can be used to visualize those properties.

5.5 Goal 4: Graph sine and cosine when there is a _____ shift.

    a. **Predict how the graph of $y = \sin x + 2$ will compare to $y = \sin x$. Then sketch one cycle of each function in the same rectangular coordinate plane for $0 \le x \le 2\pi$. (Use a different color to sketch each function.)**

    b. Sketch one period to the right and one period to the left of zero:
       $y = \sin x - 2$

    c. **Sketch two periods to the right of zero:**
       $y = 3\cos x + 1$

5.5 Goal 5: Graph sine and cosine when there is a phase shift.

a. Predict how the graph of $y = \sin(x + \frac{\pi}{2})$ will compare to $y = \sin x$. Then sketch one cycle of each function in the same rectangular coordinate plane for $0 \le x \le 2\pi$. (Use a different color to sketch each function.)

b. Determine the amplitude, period and phase shift of each function. Sketch two periods.

$y = 3 \sin \left(3x - \frac{\pi}{2} \right)$

c. Determine the amplitude, period and phase shift of each function. Sketch two periods.

5.5 Goal 4

d. Determine the amplitude, period and phase shift of each function. Sketch two periods.

$$y = -4\cos\left(2x - \frac{\pi}{2}\right)$$

e. Determine the amplitude, period and phase shift of each function. Sketch two periods.

$$y = 3\cos(2\pi x + 4\pi)$$