AP Precalc

Write your questions and thoughts here!

3.6B Sinusoidal Function Transformations

3.6B Notes

The focus of this lesson is to learn about the phase shift of a periodic function. This means we are shifting the sinusoidal function horizontally (to the left or right).

Standard equations:

$$y = a\cos\big(b(\theta \quad)\big) + d \qquad y = a\sin\big(b(\theta \quad)\big) + d$$

Graph the following sinusoid functions.

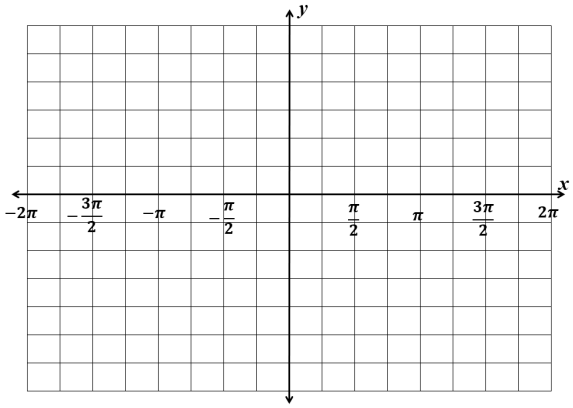
1. $f(x) = 3\cos\left(x + \frac{\pi}{4}\right) + 2$

Amp: _____ Period: _____

Midline: _____ Freq: _____

Max value: _____ Min value: _____

Phase Shift: _____



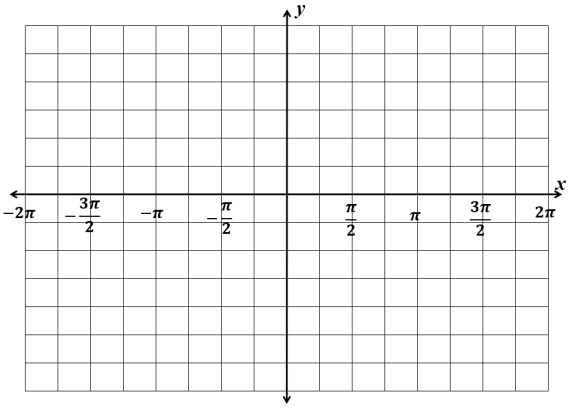
2. $y = -2\sin(2x - \pi) - 1$

Amp: _____ Period: _____

Midline: _____ Freq: _____

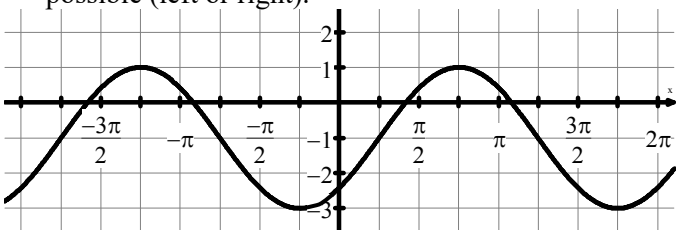
Max value: _____ Min value: _____

Phase Shift: _____



3. Create a *sine* function that has the following attributes.
   Amplitude: 3
   Period: π
   Phase Shift: left $\frac{\pi}{8}$
   Vertical Shift: down 4

4. Write the equation of the following *sine* curve. Use a positive leading coefficient and the closest phase shift possible (left or right).



3.6B Sinusoidal Functions Transformations

AP Precalculus

3.6B Practice

Identify the following attributes of each function.

1. $f(x) = 13\sin\left(4\left(x + \frac{\pi}{11}\right)\right) - 7$

Amp: _____ Period: _____

Phase Shift: _____

Vertical Shift: _____

2. $f(\theta) = 2\sin\left(\frac{\theta}{2} - \frac{\pi}{5}\right) - 5$

Amp: _____ Period: _____

Phase Shift: _____

Vertical Shift: _____

3. $f(x) = 6\cos\left(3x + \frac{\pi}{6}\right) + 11$

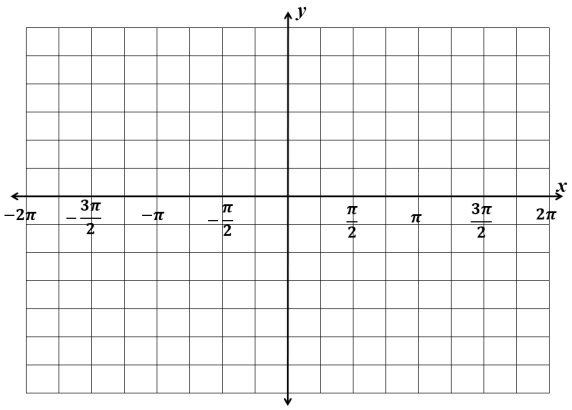
Amp: _____ Period: _____

Phase Shift: _____

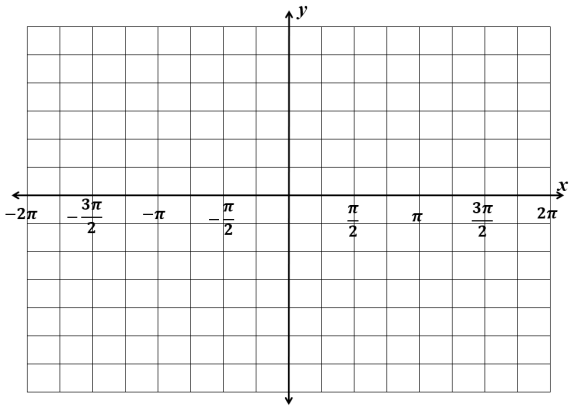
Vertical Shift: _____

Graph the trig function.

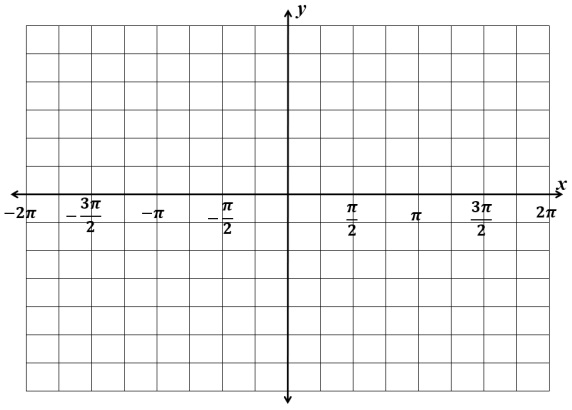
4. $y = 2\sin\left(x + \frac{\pi}{4}\right)$



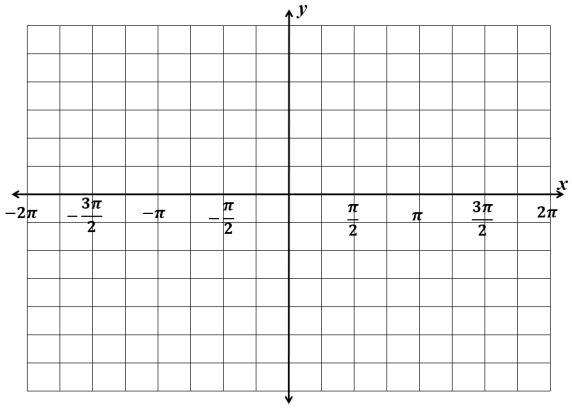
5. $y = 2 + \sin\left(2\left(x + \frac{\pi}{4}\right)\right)$



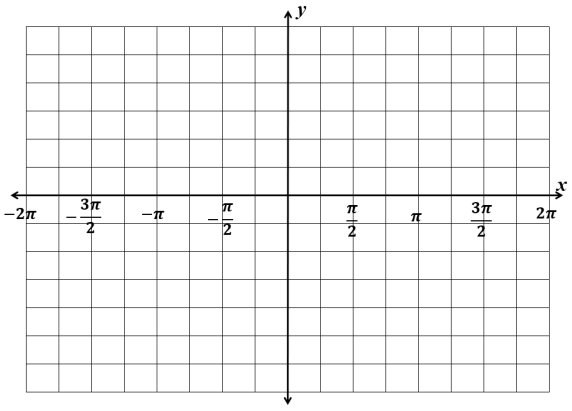
6. $y = -4\cos\left(\frac{1}{2}\left(x - \frac{\pi}{2}\right)\right) - 2$



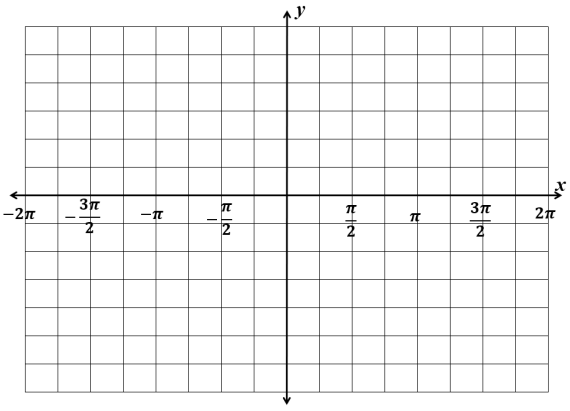
7. $y = -2\sin(2x + \pi) + 1$



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



9. $y = -3\sin\left(\frac{x}{2} + \frac{\pi}{2}\right) + 1$



Create a sine function that matches the following attributes.

10.
Amplitude: 2
Period: $\frac{3\pi}{2}$
Phase Shift: left $\frac{5\pi}{9}$
Vertical Shift: down 14

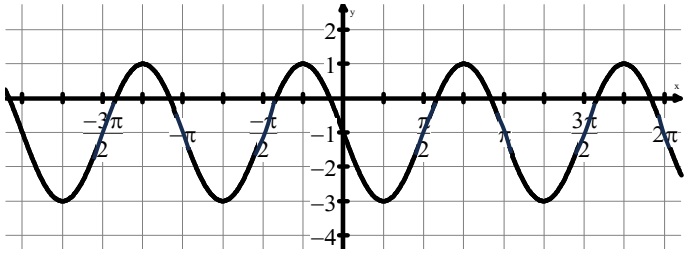
11.
Amplitude: 5
Period: $\frac{\pi}{6}$
Phase Shift: right $\frac{\pi}{24}$
Vertical Shift: up 8

12.
Amplitude: 1
Period: 6
Phase Shift: left $\frac{6\pi}{7}$
Vertical Shift: up 2

13.
Amplitude: 8
Period: $\frac{2\pi}{3}$
Phase Shift: right $\frac{\pi}{21}$
Vertical Shift: up 5

Write a sine AND cosine function for the following curves. Use a positive leading coefficient and the closest phase shift possible (left or right). For some problems, it may be equal to move left or right.

14.



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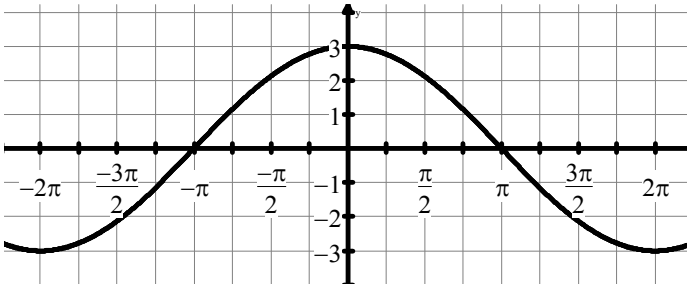


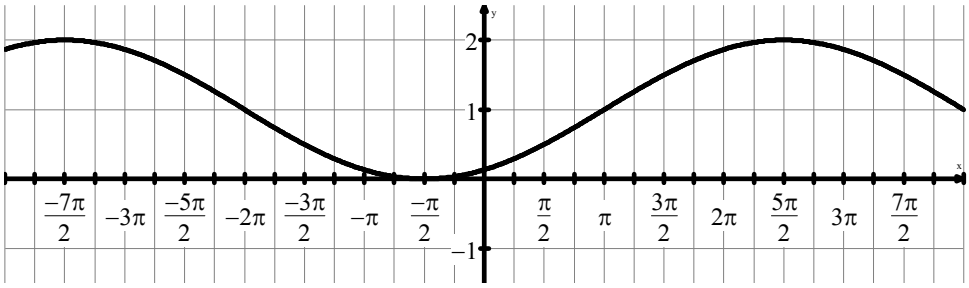
Sine equation: $y =$ _____

Cosine equation: $y =$ _____

Sine equation: $y =$ _____

Cosine equation: $y =$ _____

16.



Sine equation: $y =$ _____

Cosine equation: $y =$ _____

3.6B Sinusoidal Functions Transformations

3.6B Test Prep

17. Suppose you are riding a Ferris wheel. After everyone is loaded, the wheel starts to turn and the ride lasts 180 seconds. Your height h (in feet) above the ground at any time t (in seconds) can be modeled by the equation

$$h(t) = 85 \sin\left[\frac{\pi}{20}(t-6)\right] + 90.$$

a. What is the period?

b. What does the period represent?

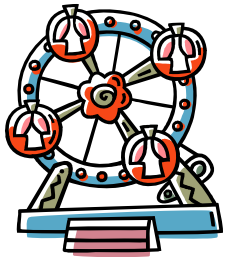
c. What is the frequency?

d. What does the frequency represent?

e. What is your maximum height?

f. What is your minimum height?

g. How many circles will the Ferris Wheel make during the ride?



h. **Calculator active.** How high are you when the ride begins? (Remember, you are not at ground level because the people in line behind you had to get on the ride.)

i. **calculator active.** How far off the ground are you when the ride stops?