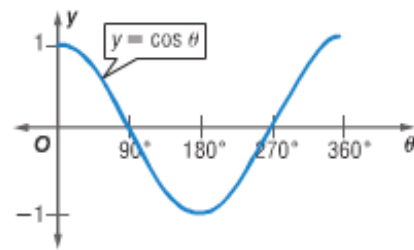
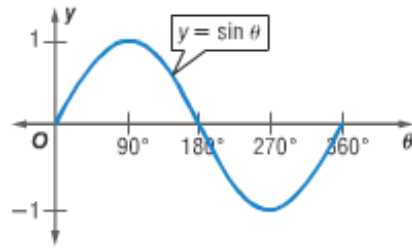


14.1/14.2 Graphing Trigonometric Functions & Translations

Do you recall the parent functions $y = \sin x$ and $y = \cos x$?



The graph of $y = A \sin (B(x - C)) + D$ and $y = A \cos (B(x - C)) + D$ are transformations of the parent functions, $y = \sin x$ and $y = \cos x$. Over the past few days you studied these transformation using a graphing calculator investigation. Tell what affects **A**, **B**, **C**, and **D** have on the graph of $y = \sin x$ and $y = \cos x$.

A _____

B _____

C _____

D _____

When graphing the sine or cosine function, it is important to know and find the following:

- Amplitude
- Period
- Center Line Axis
- Phase Shift

When graphing the sine or cosine function, **make sure to plot and label the points** where the graph crosses the **center line axis** as well as the **maximum and minimum points**.

Example 1: Graphing Sine Functions

For each of the following, find the equation of the center line axis, the period, the amplitude, and the phase shift. Draw each function showing at least one cycle. Label the high, low, and center line of one cycle.

a) $y = 2 \sin(x) - 4$

b) $y = \sin(2x) + 1$

amplitude:

period:

amplitude:

period:

center line axis:

phase shift:

center line axis:

phase shift:

x-values:

x-values:



14.1/14.2 Graphing Trigonometric Functions & Translations

c) $y = \sin(x - 30^\circ)$

amplitude: period:

center line axis: phase shift:

x-values:



d) $y = 3 \sin(2(x - 90^\circ)) + 2$

amplitude: period:

center line axis: phase shift:

x-values:



The constants **A**, **B**, **C**, and **D** have the same affect on $y = A \cos(B(x - C)) + D$ that they had on $y = A \sin(B(x - C)) + D$.

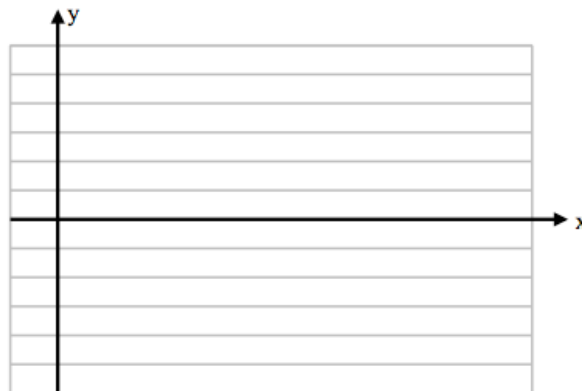
Example 2: Graphing Cosine Functions

a) $y = 3 \cos(2(x - 90^\circ)) + 2$

amplitude: period:

center line axis: phase shift:

x-values:



What happens to the graph of $y = A \cos(B(x - C)) + D$ or $y = A \sin(B(x - C)) + D$ if $A < 0$?

Example 3: Graphing Reflections

a) $y = -3 \cos(2(x - 90^\circ)) + 2$

amplitude: period:

center line axis: phase shift:

x-values:



JUST REMEMBER... **R**eflect **C**enter line axis **A**mplitude **P**eriod **P**hase Shift

Algebra 2CP
Graphing Trigonometric Functions & Translations
Worksheet #1

Name _____ Period _____

For each of the following find the equation of the center line axis, the period, the amplitude, and the phase shift. Draw each function showing at least one cycle. Label the high, low and center line points of one cycle.

1. $y = 3 \sin(0.5x)$

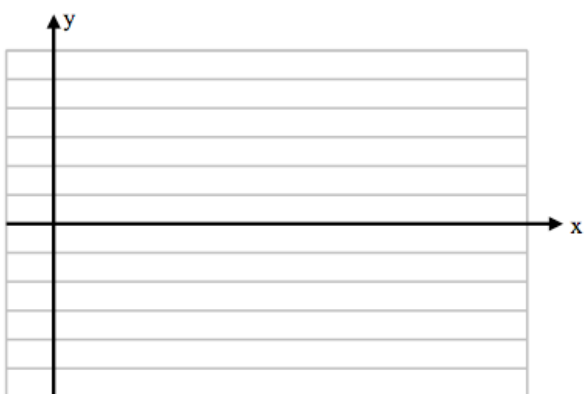
amplitude:

period:

center line axis:

phase shift:

x-values:



2. $y = 5 \sin(x) + 3$

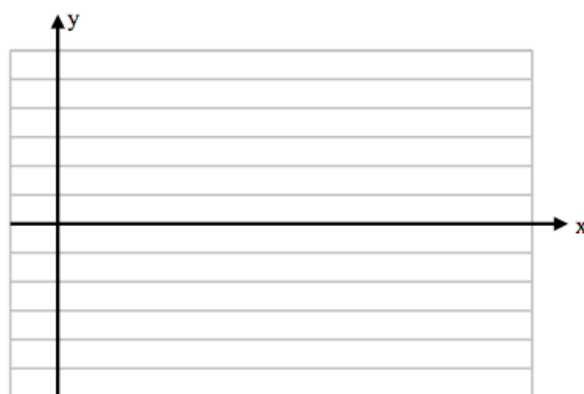
amplitude:

period:

center line axis:

phase shift:

x-values:



3. $y = \cos(2x) - 1$

amplitude:

period:

center line axis:

phase shift:

x-values:



4. $y = -\sin(2(x - 60^\circ))$

amplitude:

period:

center line axis:

phase shift:

x-values:



Algebra 2CP
Graphing Trigonometric Functions & Translations
Worksheet #1

Name _____ Period _____

5. $y = 4 \sin (0.5(x - 45^\circ))$

amplitude:

period:

center line axis:

phase shift:

x-values:



6. $y = -6 \cos (3x) + 1$

amplitude:

period:

center line axis:

phase shift:

x-values:



7. $y = 3 \cos (4(x + 30^\circ)) - 1$

amplitude:

period:

center line axis:

phase shift:

x-values:



8. $y = 2 \sin (1.5(x - 90^\circ)) + 3$

amplitude:

period:

center line axis:

phase shift:

x-values:



Algebra 2CP
Graphing Trigonometric Functions & Translations
Worksheet #2

Name _____ Period _____

For each of the following find the equation of the center line axis, the period, the amplitude, and the phase shift. Draw each function showing at least one cycle. Label the high, low and center line points of one cycle.

1. $y = 2 \sin(3x)$

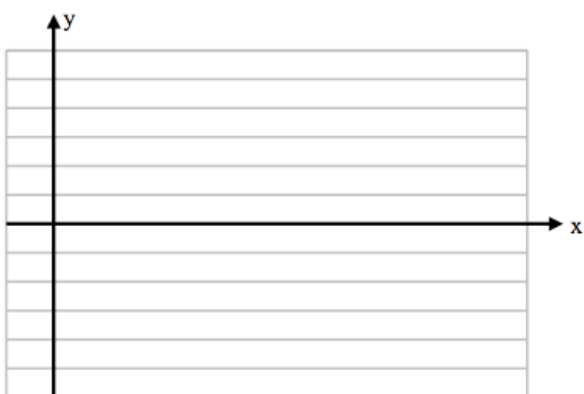
amplitude:

period:

center line axis:

phase shift:

x-values:



2. $y = -\sin(x - 180^\circ)$

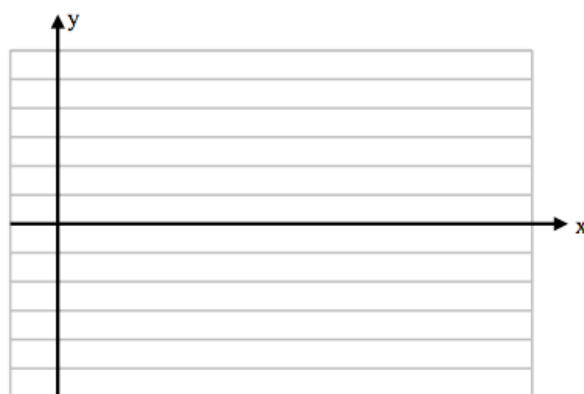
amplitude:

period:

center line axis:

phase shift:

x-values:



3. $y = 3 \cos(4x)$

amplitude:

period:

center line axis:

phase shift:

x-values:



4. $y = -\cos(2x) - 5$

amplitude:

period:

center line axis:

phase shift:

x-values:



Algebra 2CP
Graphing Trigonometric Functions & Translations
Worksheet #2

Name _____ Period _____

5. $y = 0.25 \sin(2x)$

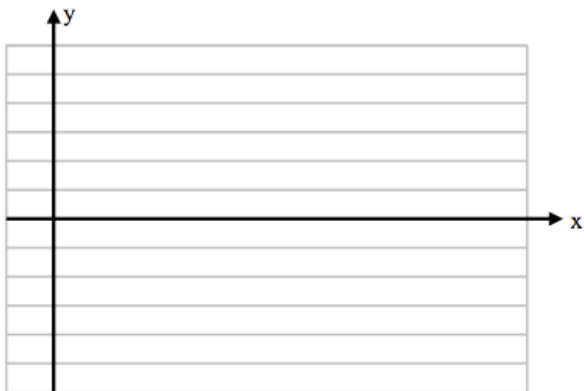
amplitude:

period:

center line axis:

phase shift:

x-values:



6. $y = 3 \cos(0.5x) + 4$

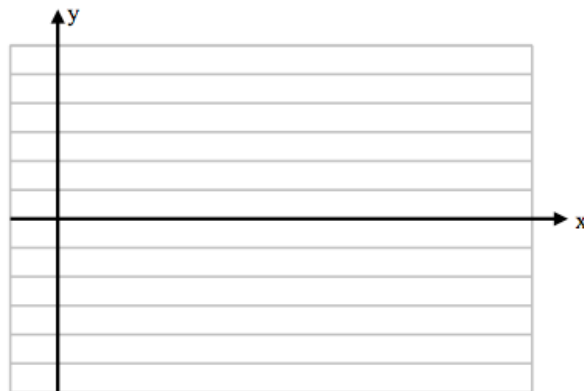
amplitude:

period:

center line axis:

phase shift:

x-values:



7. $y = -3 \sin(2(x - 90^\circ)) - 1$

amplitude:

period:

center line axis:

phase shift:

x-values:



8. $y = \cos(0.5(x - 180^\circ)) + 2$

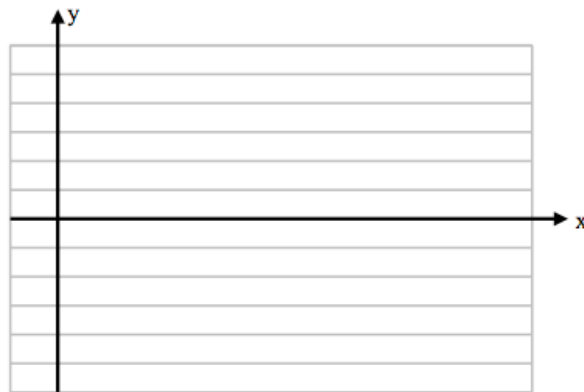
amplitude:

period:

center line axis:

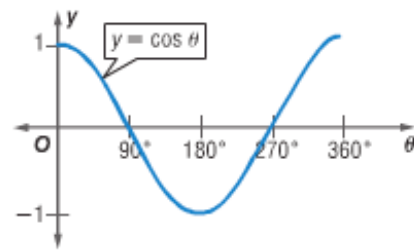
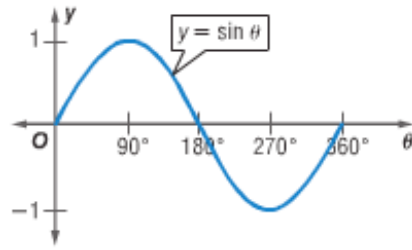
phase shift:

x-values:



14.1/14.2 Writing Equations of Trigonometric Functions

Do you recall the parent functions $y = \sin x$ and $y = \cos x$?



We learned the graph of $y = A \sin(B(x - C)) + D$ and $y = A \cos(B(x - C)) + D$ are transformations of the parent functions, $y = \sin x$ and $y = \cos x$. Let's recall what affects **A**, **B**, **C**, and **D** have on the graph of $y = \sin x$ and $y = \cos x$.

A _____

B _____

C _____

D _____

Now that you know how to graph trigonometric functions given an equation, we are going to learn how to write equations given the transformations or the graph.

Example 1: Writing Trigonometric Equations Given Transformations

Write an equation for the following, then graph.

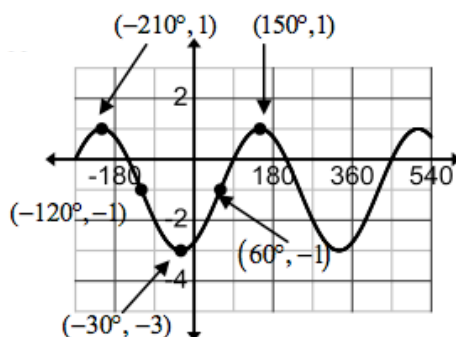
A cosine function with amplitude 3, period 180° , translated 2 units down and translated 90° to the left



Equation: _____

Example 2: Writing Trigonometric Equations Given a Graph

Write both a sine equation and a cosine equation for each of the following graph.



Before coming up with the equations, figure out the following:

center line axis: _____ period: _____

amplitude: _____

Write an equation for each:

sine equation: _____

cosine equation: _____

Algebra 2CP
Writing Equations of Trigonometric Functions

Name _____ Period _____

Write an equation for each of the following. Graph each equation.

1. A sine function with amplitude 3, period 120° , translated 3 units down and translated 50° to the left

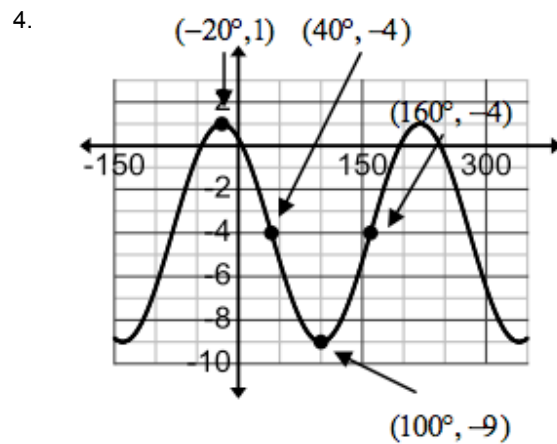
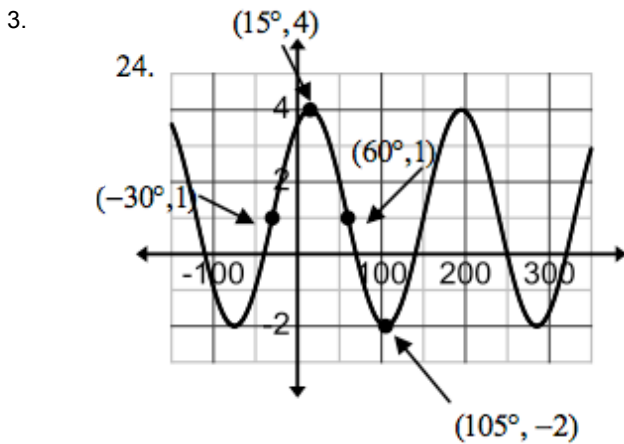
2. A cosine function, reflected over its center line axis with amplitude 3, period 450° , translated vertically 5 units and horizontally 20°

Equation: _____

Equation: _____



Write both a sine and a cosine equation for each of the following graphs.



Sine Equation: _____

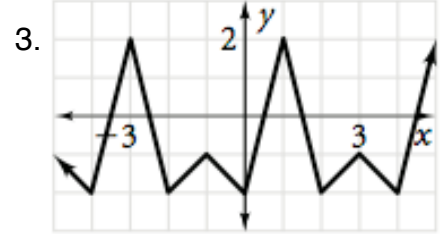
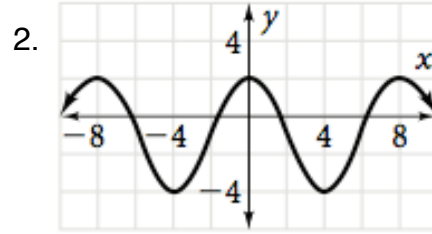
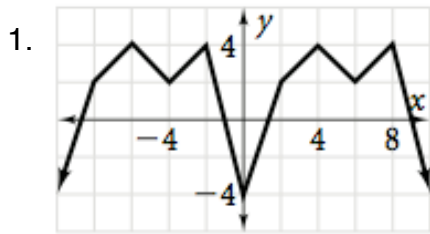
Sine Equation: _____

Cosine Equation: _____

Cosine Equation: _____

Algebra 2CP
Chapter 14 YOU CAN...

❖ **Identify the cycle, period, amplitude, equation of the center line, and frequency of a periodic function given its graph**

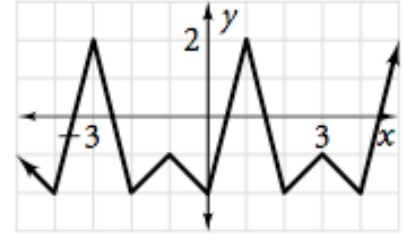
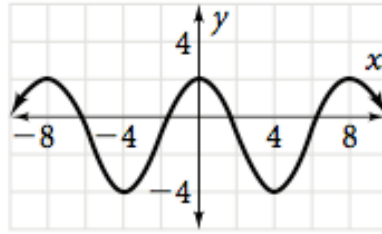
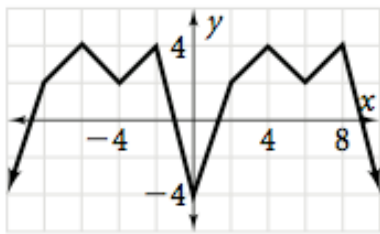


❖ **Redraw a graph given its translations**

4. a vertical translation of 1

5. the period was doubled

6. a horizontal translation of -2



❖ **Tell whether each statement describes a characteristic of the sine function, cosine function, both functions or neither function**

7. the amplitude of the function is -1

10. the function is increasing from $0^\circ < x < 90^\circ$

8. the graph crosses the x-axis at multiples of 180°

11. the range of the function is $-1 \leq y \leq 1$

9. the center line axis of the function is $y = 0$

12. the function passes through $(0, 1)$

❖ **Find the domain values for which the graph of...**

13. $y = \sin(x)$ increases from -1 to 0

15. $y = \cos(x)$ decreases from 1 to 0

14. $y = \sin(x)$ decreases from 0 to 1

16. $y = \cos(x)$ increases from 0 to 1

❖ **Graph translations of sine and cosine graphs**

17. $y = 2 \sin(3(x - 45^\circ)) + 1$

18. $y = -3 \cos(4(x + 30^\circ)) - 1$

19. $y = 4 \cos(2(x + 30^\circ)) - 5$

❖ **Write equations of trigonometric functions given the translations or graph**

20. A cosine function, reflected over its center line axis with amplitude 3, period 450° , translated vertically 5 units and horizontally 20°

21. Write a sine equation and cosine function for the graph on the right.

