

### Finding Trig Functions to Match Data

Once you become a master at graphing sine and cosine you can work backwards to figure out an equation that passes through a bunch of data.

1. Quickly graph the function  $y = 3 \sin\left(\frac{x}{2}\right) + 1$  on scrap paper.
    - a. Find all values of  $x$  such that  $3 \sin\left(\frac{x}{2}\right) + 1 = 4$ .
    - b. How can you determine the period of the function based on your answer?
    - c. Find all values of  $x$  such that  $3 \sin\left(\frac{x}{2}\right) + 1 = -2$ .
    - d. How can you determine the period of the function based on your answer?
  
  2. Modeling a function with a trigonometric function means we want to work in reverse. That means we need to be able to find the period of the function and the value of  $B$  in the general equation. The following table gives the maximum, minimum, and S.A. intersection points on the graph of a sine curve.
- |        |    |    |   |   |   |    |   |    |
|--------|----|----|---|---|---|----|---|----|
| $x$    | -4 | -2 | 0 | 2 | 4 | 6  | 8 | 10 |
| $f(x)$ | 1  | -3 | 1 | 5 | 1 | -3 | 1 | 5  |
- a. Plot the points and draw a smooth curve through the points.
  - b. Determine the period of the function and use that to determine the value of  $B$ .
  - c. Determine the sinusoidal axis of the function.
  - d. Determine the amplitude of the function.
  - e. Choose a starting point and use it to decide if you are dealing with a sine or cosine function. At this point you should also determine if the value of  $A$  is positive or negative.
  - f. Write the equation of the sinusoid you've developed. Graph the function and check to see if it does pass through the given points.
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3. Each set of points below is from a sinusoidal curve. Repeat the process above to determine an equation of a curve that passes through the points. Many correct answers are possible. Check your solution by graphing the scatter plot and your equation. Try to find more than one curve that fits the points.

$x$	-6	-3	0	3	6
$f(x)$	30	70	30	70	30

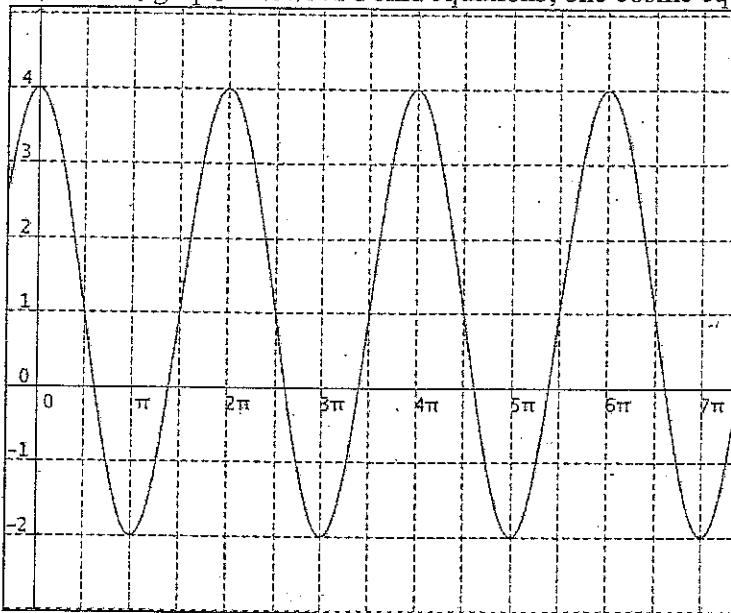
$x$	3.125	4.375	5.625	6.25
$f(x)$	2	-3	2	-5

$t$	0	1	2	3	4
$h(t)$	2	8	2	8	2

$\theta$	0	10	20	30	40
$f(\theta)$	-4	1	6	1	-4

## Writing Equations for Graphs of Sine and Cosine

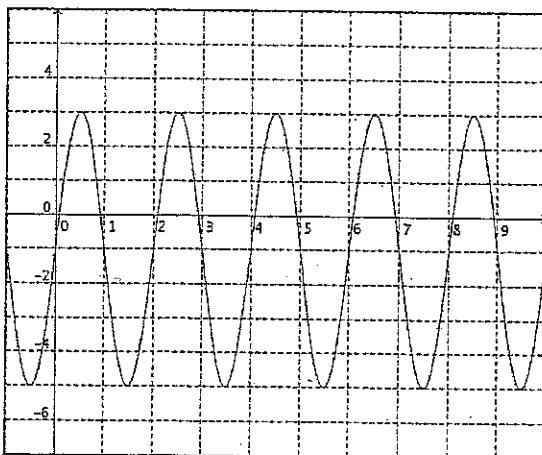
Use the techniques you developed while writing equations from data to write three different equations for the graph below: two sine equations, one cosine equation.



As we know, there are several different characteristics to any sinusoid: sinusoidal axis, amplitude, period, and phase-shift. Think about how you figured each of them out for the graph above. If you could do that problem, then you can do any problem like it.

Why is the phase-shift the most dicey to figure out?

Fill in the box on the right for each of the following graphs. Make sure that at least one of your equations is different (two sine and one cosine or two cosine and one sine).



Period: \_\_\_\_\_

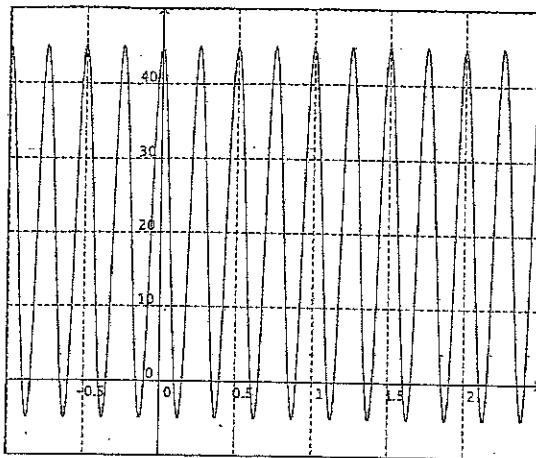
Sinusoidal Axis: \_\_\_\_\_

Amplitude: \_\_\_\_\_

Equation 1: \_\_\_\_\_

Equation 2: \_\_\_\_\_

Equation 3: \_\_\_\_\_



Period: \_\_\_\_\_

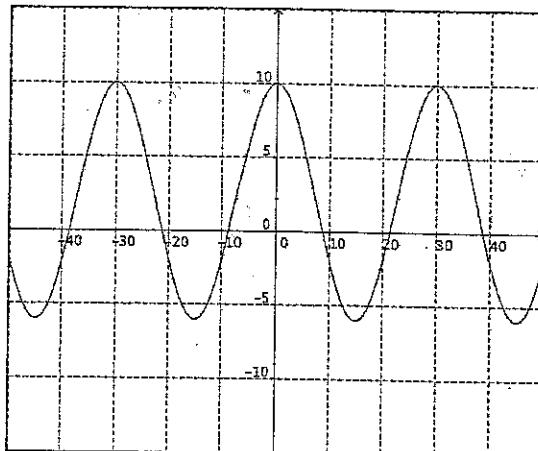
Sinusoidal Axis: \_\_\_\_\_

Amplitude: \_\_\_\_\_

Equation 1: \_\_\_\_\_

Equation 2: \_\_\_\_\_

Equation 3: \_\_\_\_\_



Period: \_\_\_\_\_

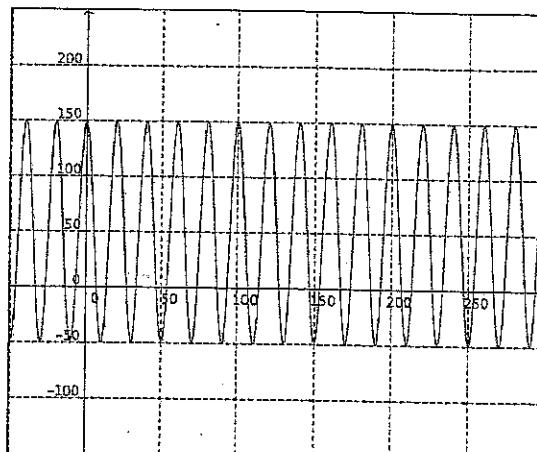
Sinusoidal Axis: \_\_\_\_\_

Amplitude: \_\_\_\_\_

Equation 1: \_\_\_\_\_

Equation 2: \_\_\_\_\_

Equation 3: \_\_\_\_\_



Period: \_\_\_\_\_

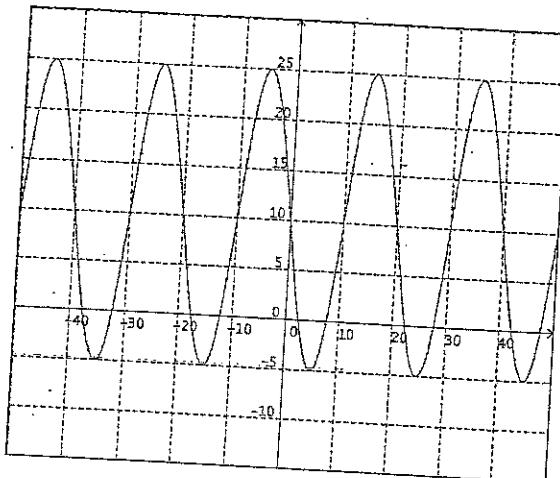
Sinusoidal Axis: \_\_\_\_\_

Amplitude: \_\_\_\_\_

Equation 1: \_\_\_\_\_

Equation 2: \_\_\_\_\_

Equation 3: \_\_\_\_\_



Period: \_\_\_\_\_

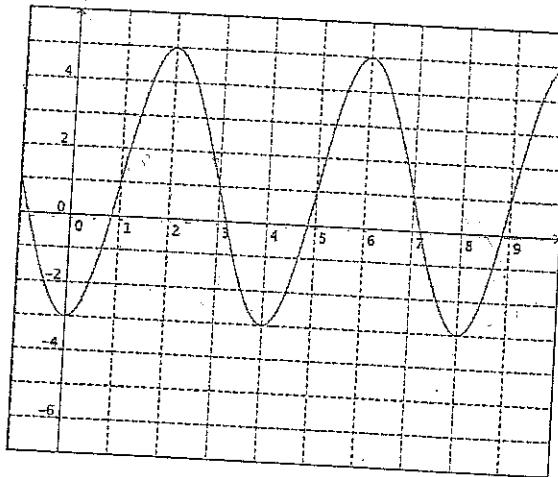
Sinusoidal Axis: \_\_\_\_\_

Amplitude: \_\_\_\_\_

Equation 1: \_\_\_\_\_

Equation 2: \_\_\_\_\_

Equation 3: \_\_\_\_\_



Period: \_\_\_\_\_

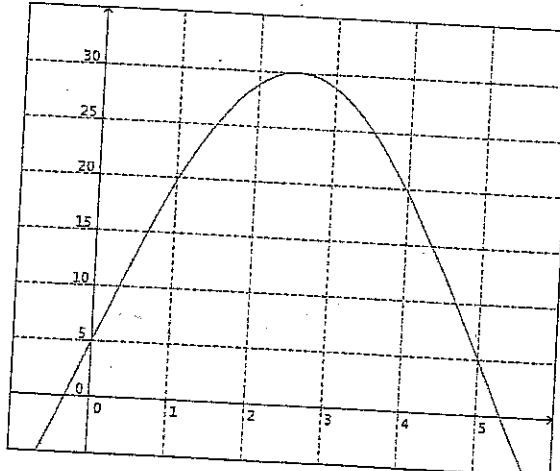
Sinusoidal Axis: \_\_\_\_\_

Amplitude: \_\_\_\_\_

Equation 1: \_\_\_\_\_

Equation 2: \_\_\_\_\_

Equation 3: \_\_\_\_\_



Period: \_\_\_\_\_

Sinusoidal Axis: \_\_\_\_\_

Amplitude: \_\_\_\_\_

Equation 1: \_\_\_\_\_

Equation 2: \_\_\_\_\_

Equation 3: \_\_\_\_\_

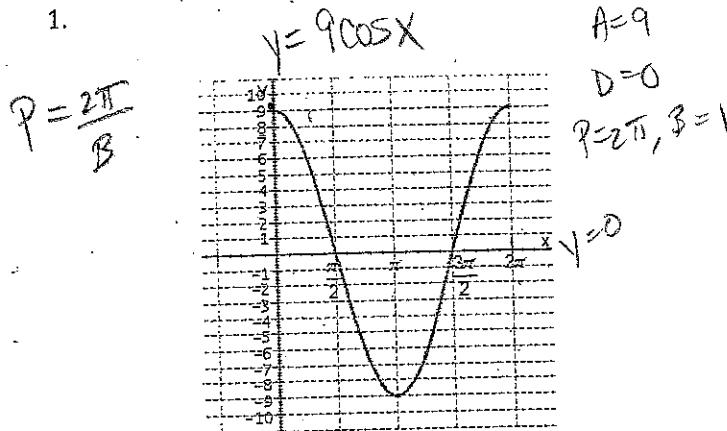
Name \_\_\_\_\_

## Finding the Equation given the graph

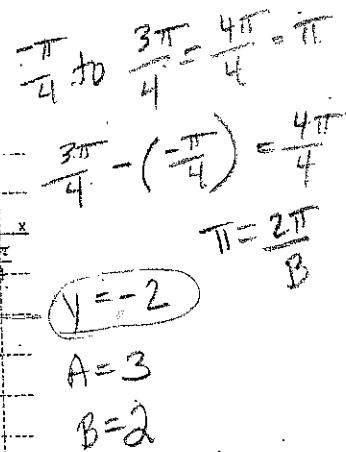
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Directions for all graphs: The graph below is one complete cycle of the graph of an equation containing a trigonometric function. Find an equation to match the graph. If you are using a graphing calculator, graph your equation to verify that it is correct.

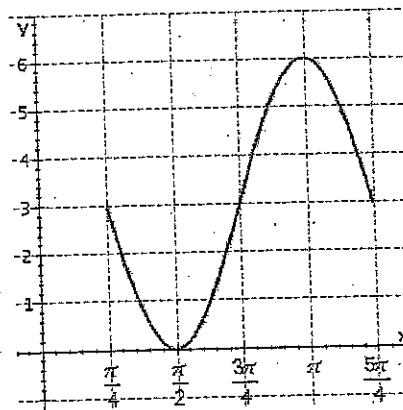
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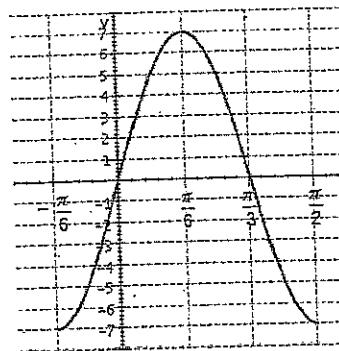
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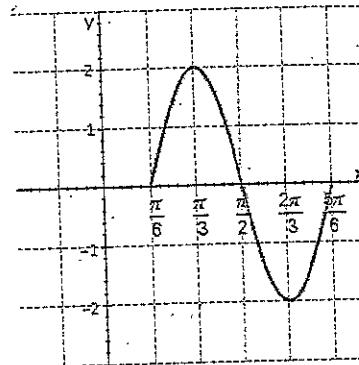
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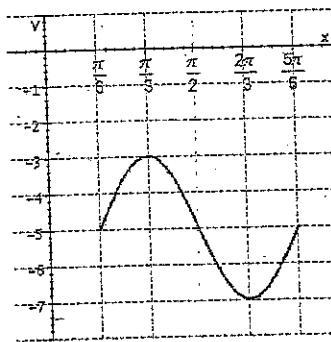
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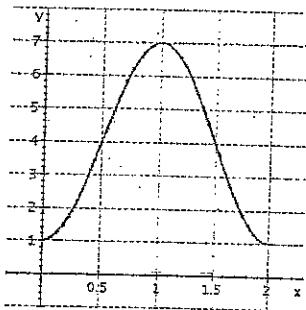


3.

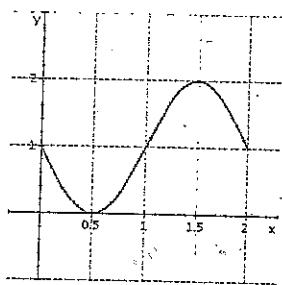


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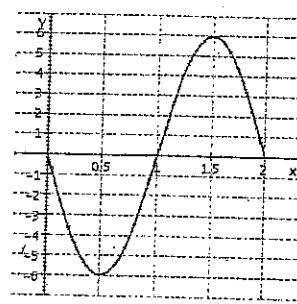
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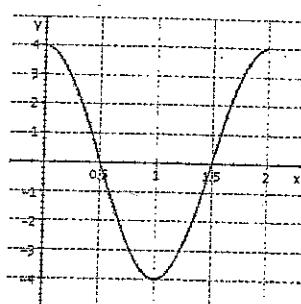
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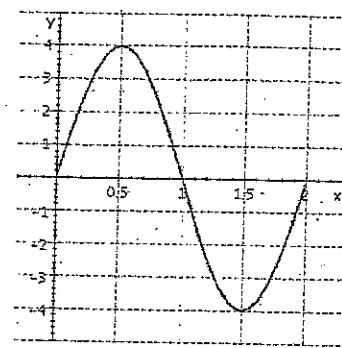
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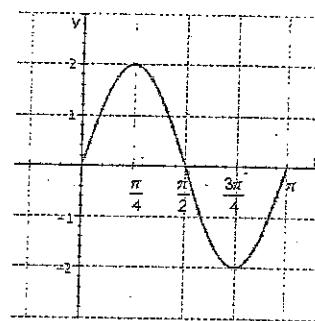
10.



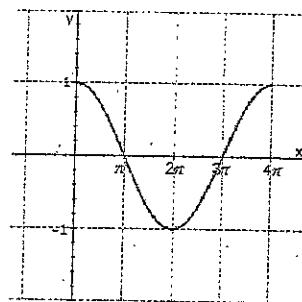
11.



12.



13.



14.

