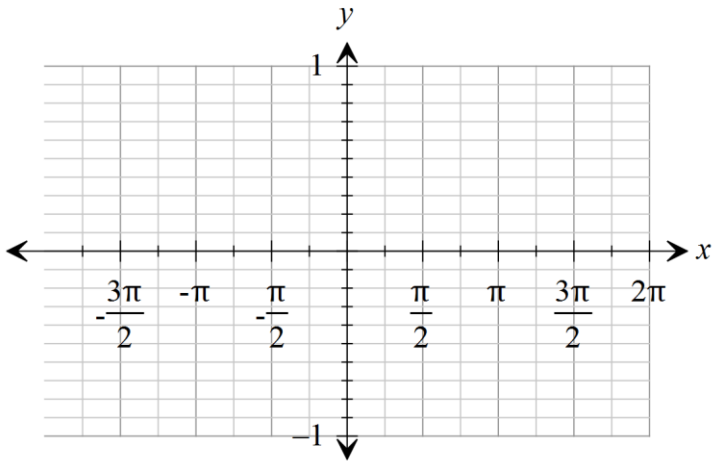
8.1 – Graphing Sine and Cosine

A. Graph Sine and Cosine

Parent sine graph $f(\theta) = \sin\theta$

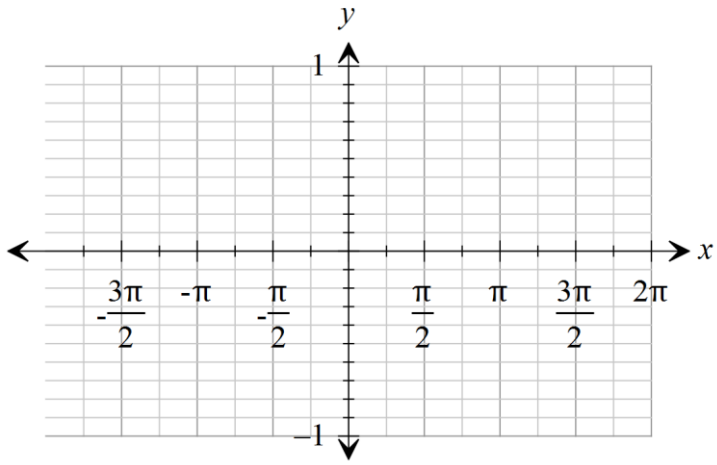
Draw the graph and make a table.



θ					
$y = \sin\theta$					

Parent cosine graph $f(\theta) = \cos\theta$

Draw the graph and make a table.



θ					
$y = \cos\theta$					

B. Transformations

1. What are the 4 types of transformations?

-
-
-
-

2. What is the general equation for a trigonometric function? _____

Amplitude and Vertical Shift:

$|A| =$

Vertical Shift=

4. Which part of the equation corresponds with a *vertical stretch* (dilation)? _____
   - In the parent graph this is: _____.

5. Which part of the equation corresponds with a *vertical shift* (translate up or down)?_____
   - In the parent graph this is: _____.

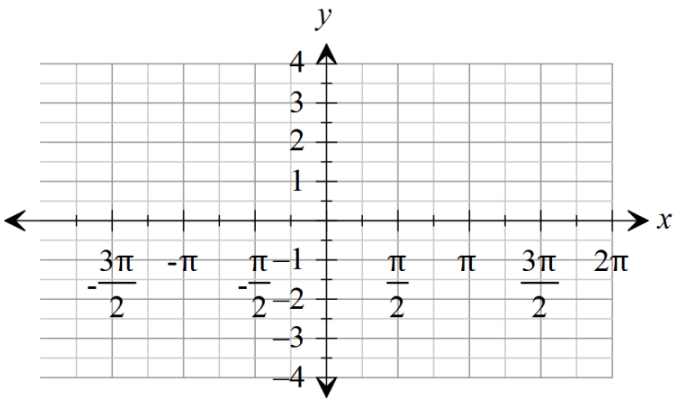
6. The ***midline*** of the graphs of $\sin\theta$ and $\cos\theta$ divide the graph in half *horizontally*.
   - The midline of the of the parent graphs is: _____

C. Making the Graph (Amplitude, Midline, Vertical Shift and Reflections)

EX. 1) $f(\theta) = \sin\theta - 2$

Midline_____ Amplitude_____ Vertical Shift_____

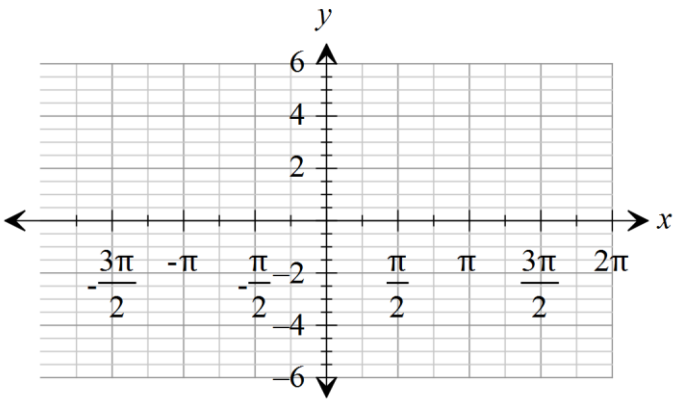
θ					
$y = \sin\theta$					



EX. 2) $f(\theta) = \cos\theta + 4$

Midline_____ Amplitude_____ Vertical Shift_____

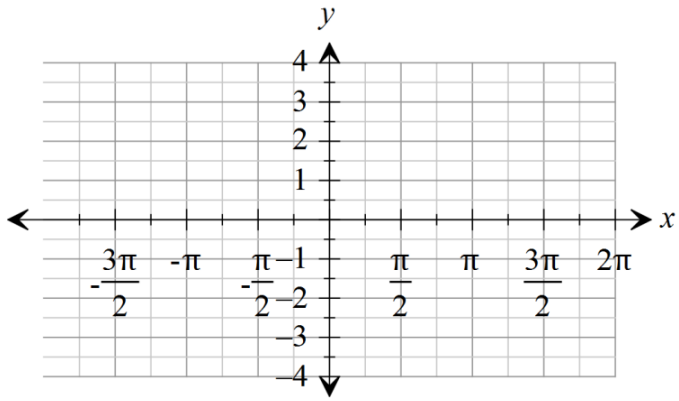
θ					
$y = \cos\theta$					



EX. 3) $f(\theta) = -5\sin\theta$

Midline_____ Amplitude_____ Vertical Shift_____

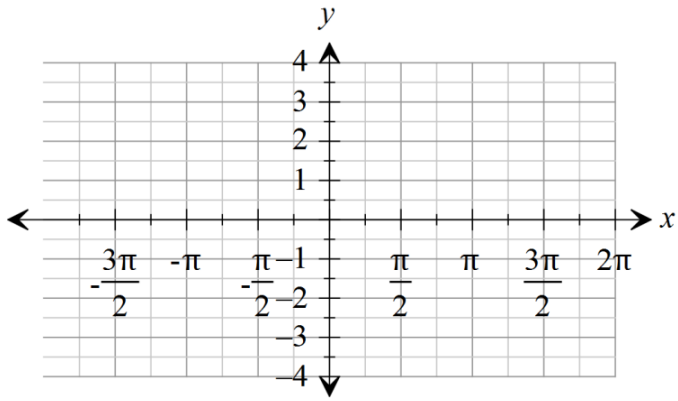
θ					
$y = \cos\theta$					



EX.4) $f(\theta) = -2\cos\theta - 3$

Midline_____ Amplitude_____ Vertical Shift_____

θ					
$y = \sin\theta$					

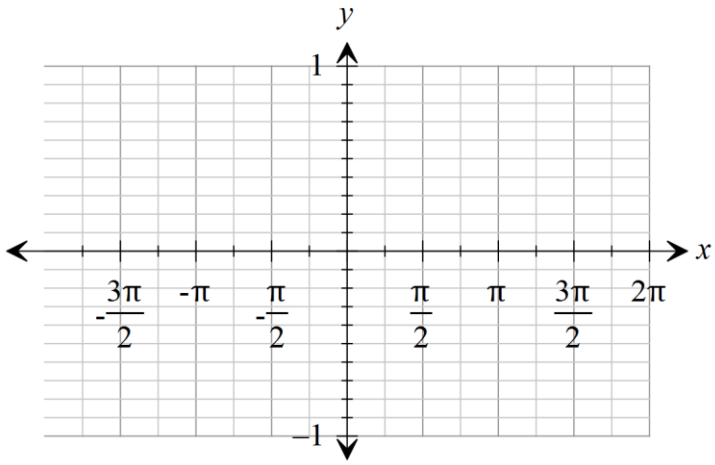


8.2N – Graphing Sine and Cosine

A. Graph Sine and Cosine

Parent sine graph $f(\theta) = \sin\theta$

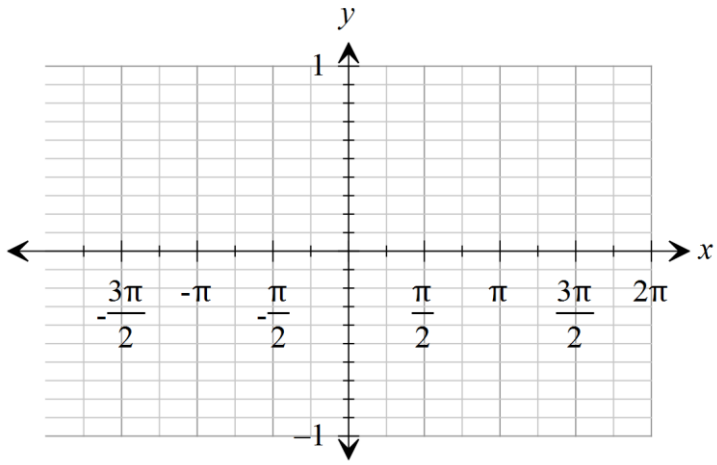
Draw the graph and make a table.



θ					
$y = \sin\theta$					

Parent cosine graph $f(\theta) = \cos\theta$

Draw the graph and make a table.



θ					
$y = \cos\theta$					

B. Transformations

1. From the 4 transformations in 9.1, today we are discussing _____ and _____.

2. What is the general equation for a trigonometric function? _____

Phase shift and Period:

Phase Shift = **Period=**

3. Which variable in the equation is related to a *horizontal shift*? _____
   - In the parent graph this is: _____

4. Which variable in the equation is related to a *horizontal stretch*? _____
   - In the parent graph this is: _____
   - This is used to find the period. The formula for *period* is: _____
   - The *period* in the parent graph is _____

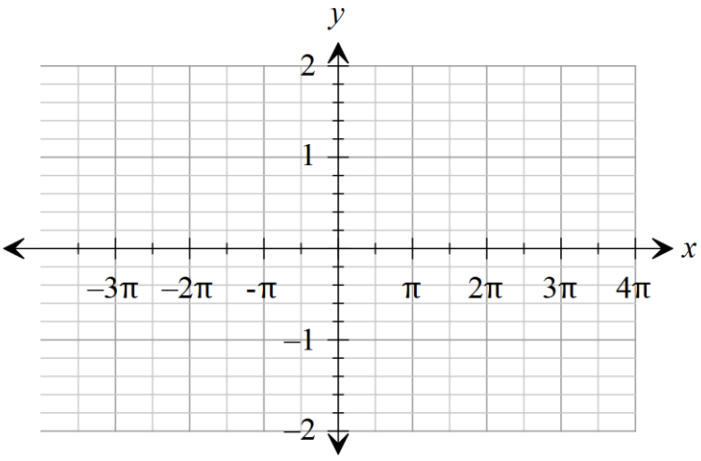
5. *Frequency* is defined as the number of oscillations or rotations per unit of time.
   - *Frequency* is the reciprocal of the period. The formula for *frequency* is _____
   - The *frequency* in the parent graph is _____

D. Making the Graph. (Phase Shift and Period)

EX. 1) $f(\theta) = \sin(\theta + \pi)$

Phase Shift_____ b____ Period_____ Freq._____

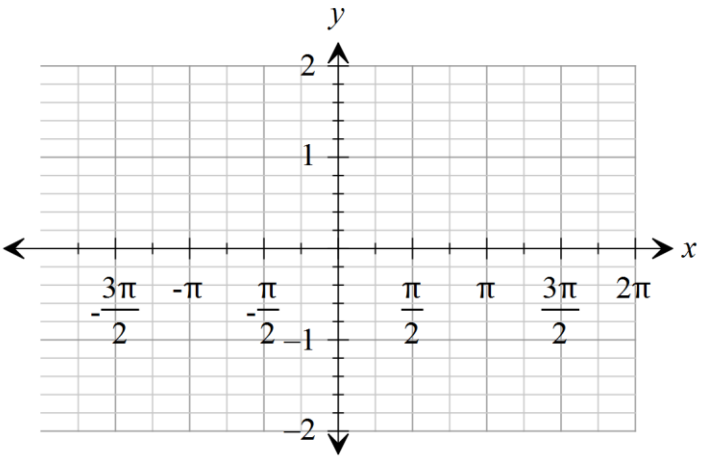
θ					
$y = \sin\theta$					



EX. 2) $f(\theta) = \cos\left(\theta - \frac{\pi}{4}\right)$

Phase Shift_____ b____ Period_____ Freq._____

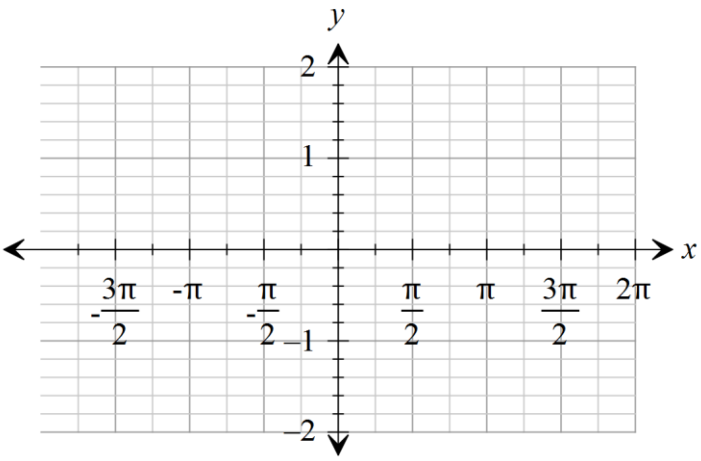
θ					
$y = \cos\theta$					



EX. 3) $f(\theta) = \cos 2\theta$

Phase Shift_____ b____ Period_____ Freq._____

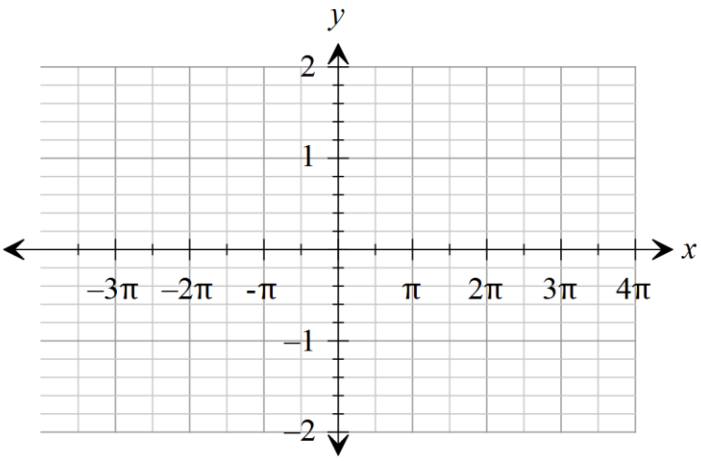
θ					
$y = \cos\theta$					



EX. 4) $f(\theta) = \sin\frac{\theta}{4}$

Phase Shift_____ b____ Period_____ Freq._____

θ					
$y = \sin\theta$					



EX. 5) $f(\theta) = -\sin 2(\theta - \pi)$

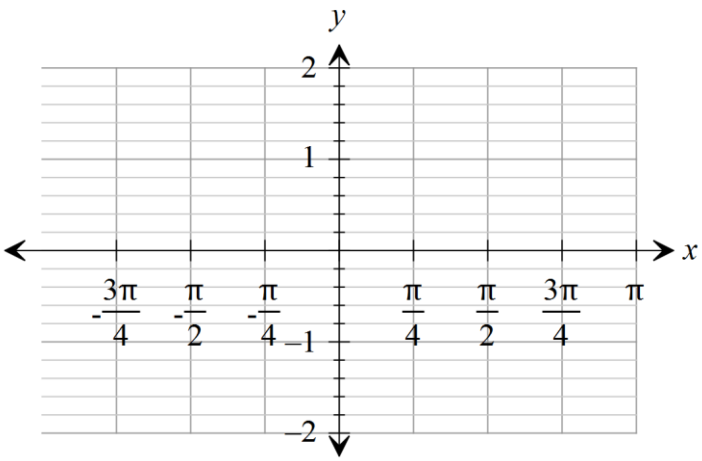
Phase Shift_____ b____ Period_____ Freq._____

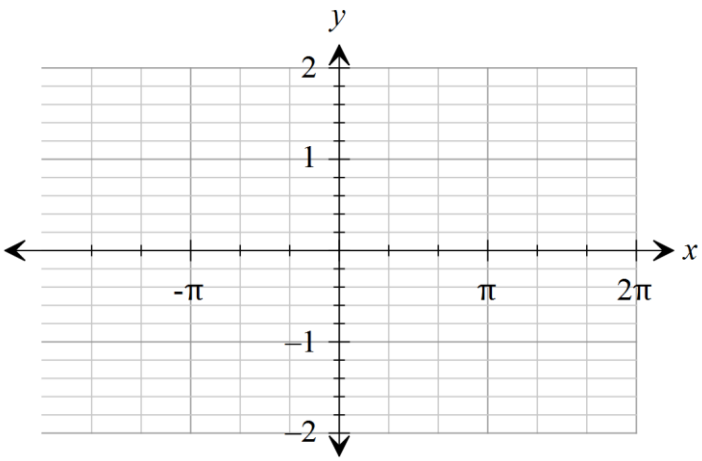
EX. 6) $f(\theta) = \cos 3\left(\theta + \frac{\pi}{3}\right)$

Phase Shift_____ b____ Period_____ Freq._____

θ					
$y = \sin\theta$					

θ					
$y = \cos\theta$					



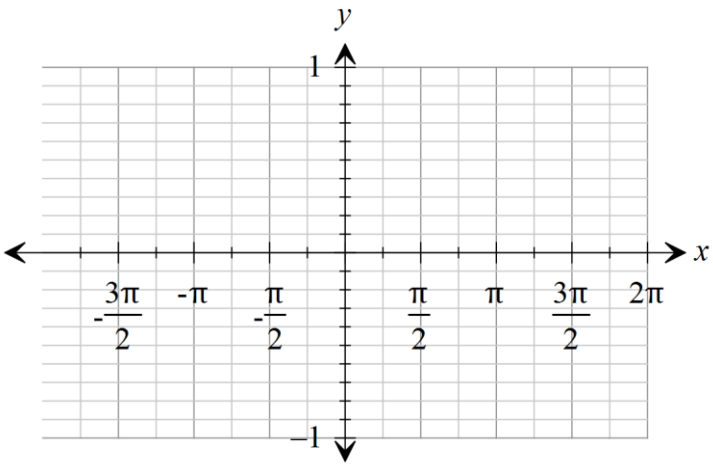


8.3N – Review graphing sine and cosine

A. Graph Sine and Cosine

Parent sine graph $f(\theta) = \sin\theta$

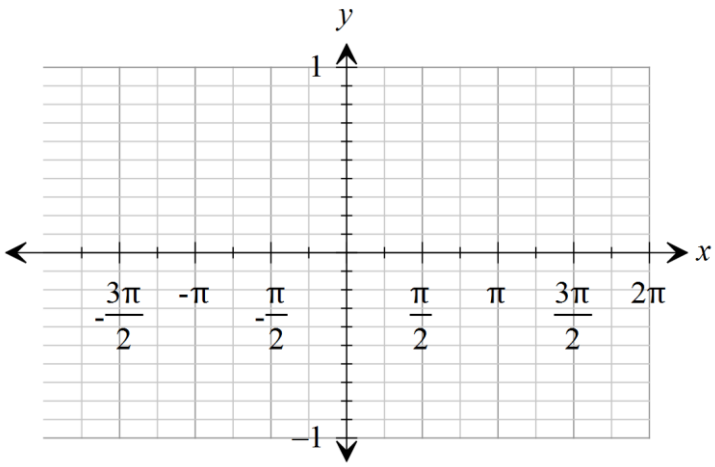
Draw the graph and make a table.



θ					
$y = \sin\theta$					

Parent cosine graph $f(\theta) = \cos\theta$

Draw the graph and make a table.



θ					
$y = \cos\theta$					

For the parent graph of $f(\theta) = \sin\theta$

Vertical shift:

Amplitude:

b:

Period:

Phase shift:

Frequency:

For the parent graph of $f(\theta) = \cos\theta$

Vertical shift:

Amplitude:

b:

Period:

Phase shift:

Frequency:

Steps for when you do all 4 transformations in one function

1.

2.

3.

4.

5.

B. Examples

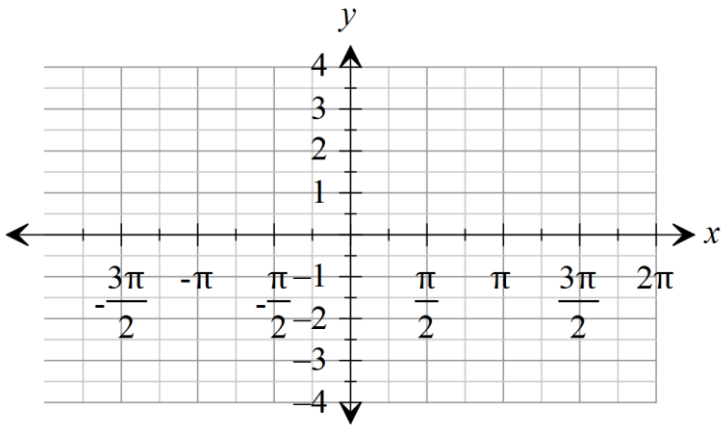
EX. 1 $f(\theta) = 3\sin\left(\theta + \frac{\pi}{2}\right)$

Vertical Shift (k): _____

Amplitude (a): _____

Phase Shift (h): _____

Period: _____



θ					
$y = \sin\theta$					

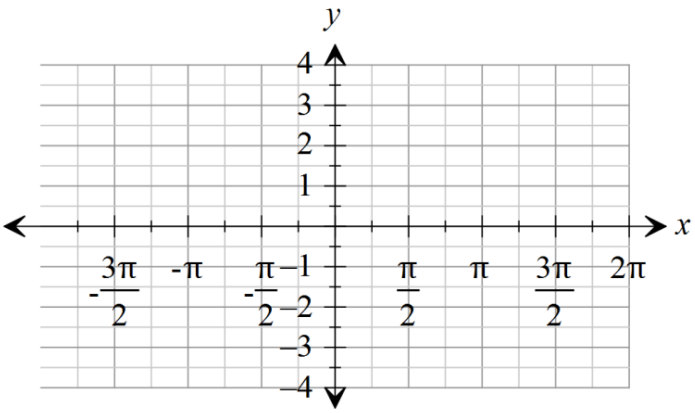
EX. 2 $f(\theta) = -\cos\left(4\left(\theta - \frac{\pi}{4}\right)\right)$

Vertical Shift (k): _____

Amplitude (a): _____

Phase Shift (h): _____

Period: _____



θ					
$y = \cos\theta$					

EX. 3 $f(\theta) = -4\cos 2\theta - 3$

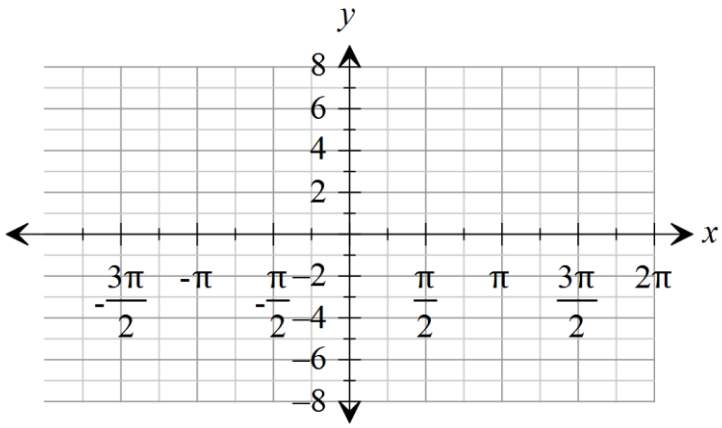
Vertical Shift (k): _____

Amplitude (a): _____

Phase Shift (h): _____

Period: _____

θ					
$y = \cos\theta$					



EX. 4 $f(\theta) = 2\sin\frac{1}{2}(\theta - \pi) + 1$

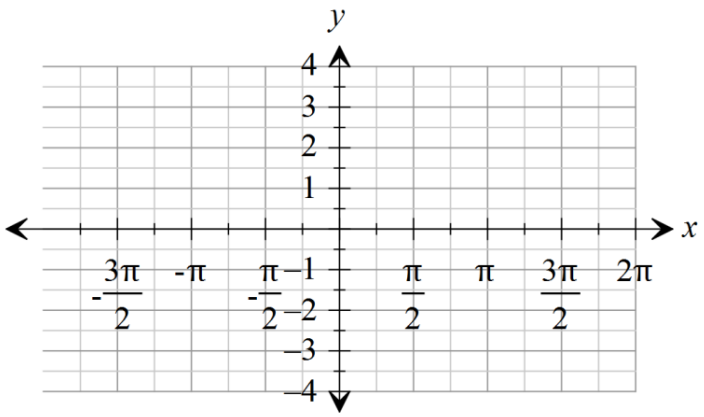
Vertical Shift (k): _____

Amplitude (a): _____

Phase Shift (h): _____

Period: _____

θ					
$y = \sin\theta$					



8.4N – Modeling Periodic Behavior

A. Write an equation for the sine curve that has the given information.

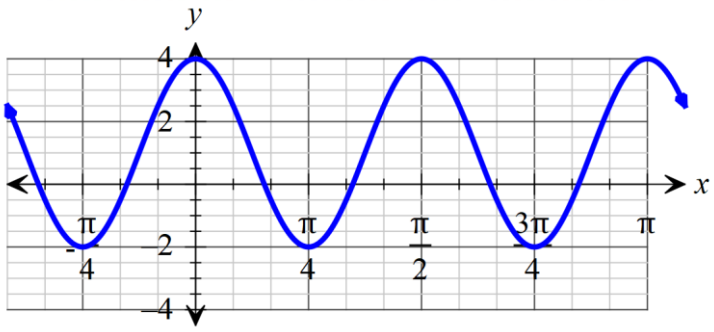
1. Amplitude = 4 Vertical Shift = down 2 Period = π **2.** Amplitude = 3 Phase Shift = right $\frac{\pi}{3}$ Period = $\frac{\pi}{4}$

B. Write an equation for the cosine curve that has the given information.

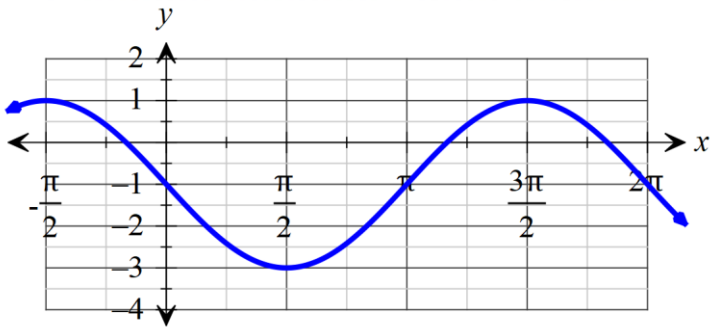
1. Amplitude = 1 Vertical Shift = up $\frac{5}{8}$ Period = $\frac{\pi}{6}$ **2.** Amplitude = 3 Phase Shift = left $\frac{\pi}{6}$ Period = 2π

C. Given the graph, write either a sine or cosine equation.

1. $\cos(\theta)$



2. $\sin(\theta)$



D. Read each story and write the appropriate trigonometric function to model each periodic situation below.

1. At the Bay of Fundy, low tide is at 11:30 am and high tide is at 5:30 pm. The water level varies 50 feet between low and high tide. Write a cosine equation that represents this function.

2. On Mars at the equator, the temperature varies from 70° F to -100° F in a single day. Write a sine equation that represents this function.

3. A Ferris wheel 100 feet in diameter makes one revolution every 60 seconds. The center of the wheel is 60 above the ground. People load at the bottom of the Ferris wheel. Write a cosine function to model the height of a car on the Ferris wheel at any time *t.*

4. A greater wax moth has hearing capable of sensing high-frequency sounds up to 300,000 cycles per second. Write a sine function representing the sound wave of the pitch. (Amplitude is 1.)