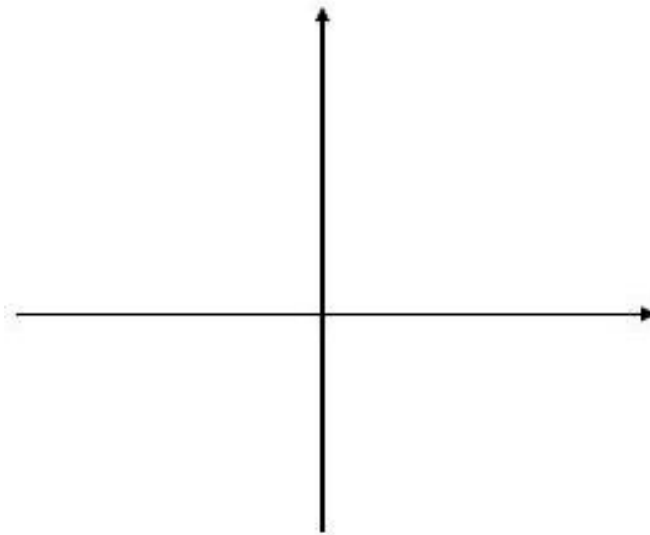
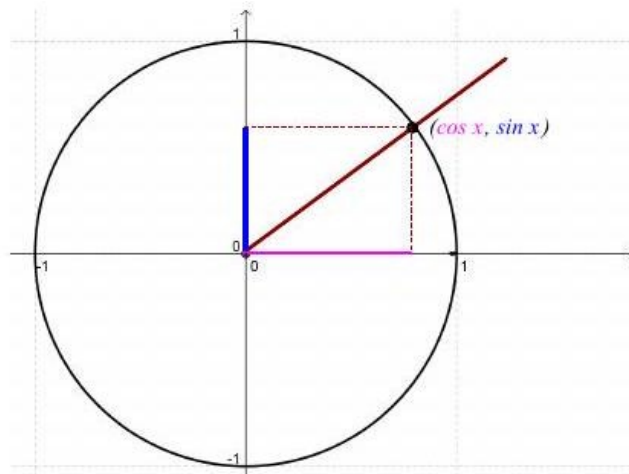


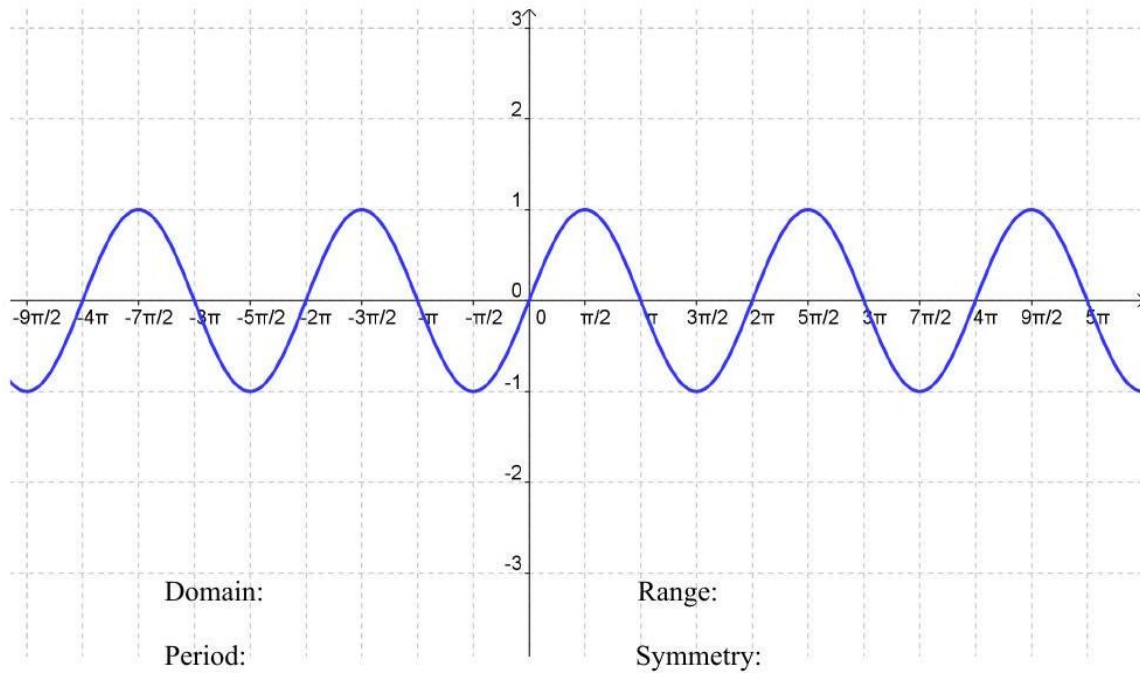
Math 1060 ~ Trigonometry

7 Graphing The Cosine and Sine Functions

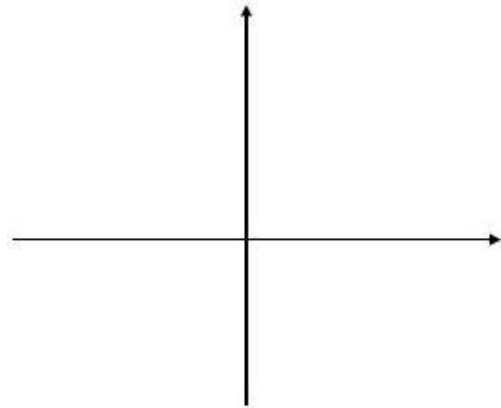
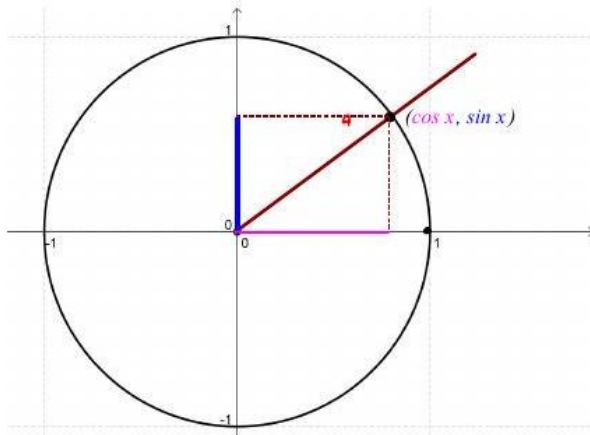
$$f(x) = \sin x$$



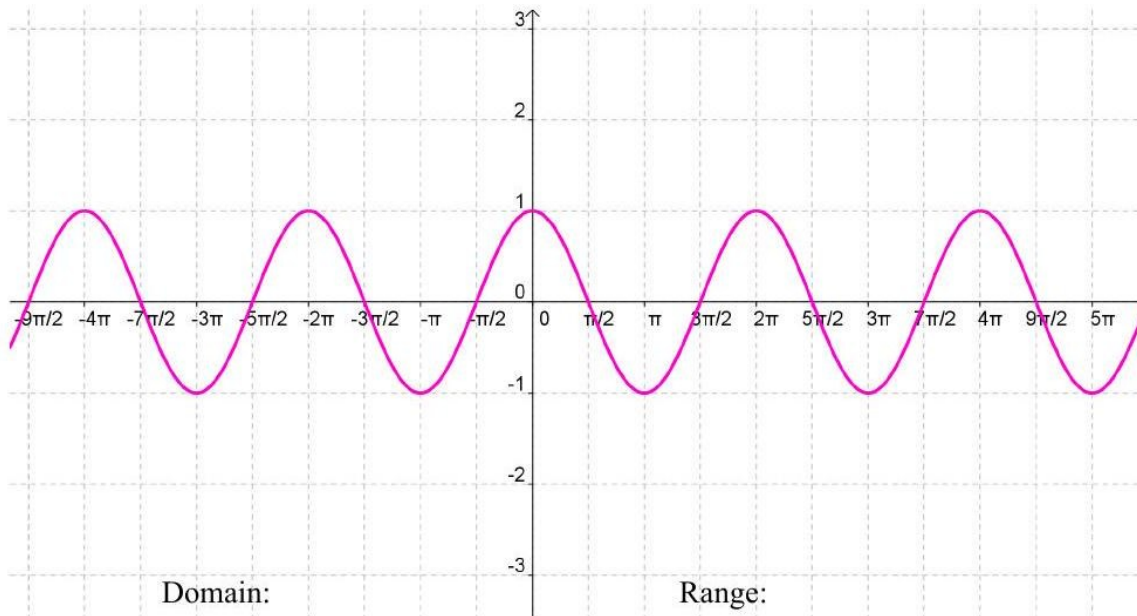
Graph of $f(x) = \sin x$



$$f(x) = \cos x$$



Graph of $f(x) = \cos x$



Domain:

Range:

Period:

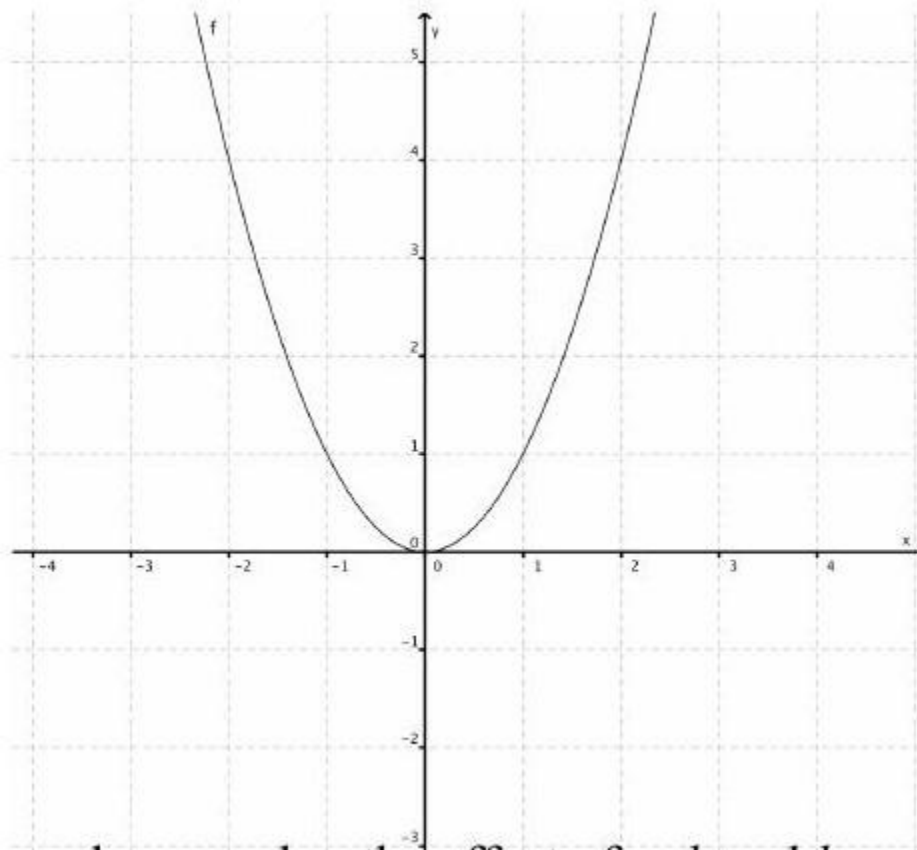
Symmetry:

How can you graph $y = 2\sin\left(x - \frac{\pi}{3}\right) + 1$?

This is a transformation of the basic $y = \sin x$ curve.

It may help to remember transformations to one of the algebraic functions.

How does the graph of $y = -3(x + 2)^2 - 1$ relate to the graph of $y = x^2$?



In general, remember the effect of a , h and k on the graph of $y = x^2$.

$$y = a(x - h)^2 + k$$

$$y = A\sin(b(x - h)) + k$$

What effect do A , b , h and k have on the graph of trigonometric functions?

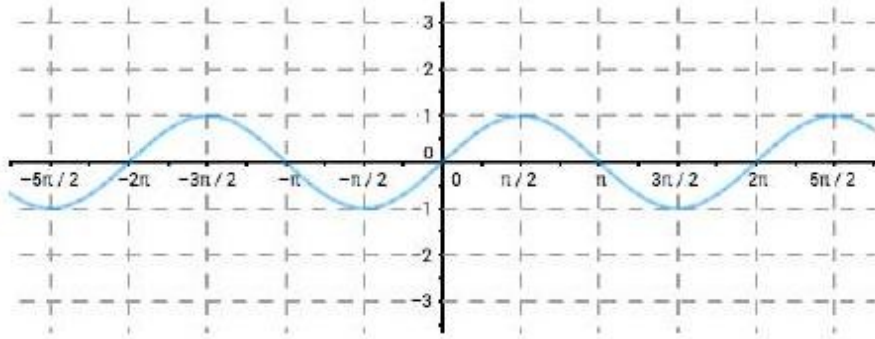
Let's look at it one part at a time: $y = A\sin x$

- Amplitude: $|A|$

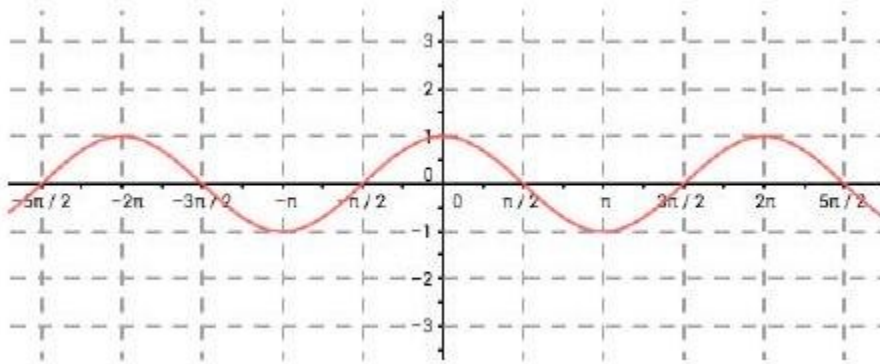
EX 1

Graph each of these.

$$y = 3\sin x$$



$$y = -2\cos x$$



Periodic Functions

A function is periodic if there is a real number p so that $f(x + p) = f(x)$. The smallest positive number p , if it exists is called the period of f .

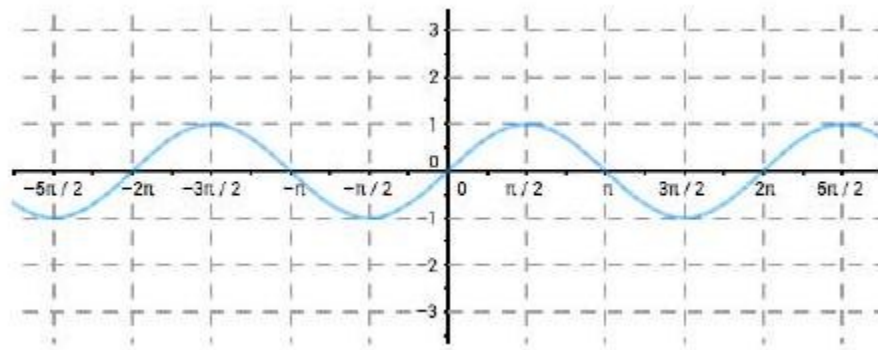
$$y = \sin(bx)$$

- Period =

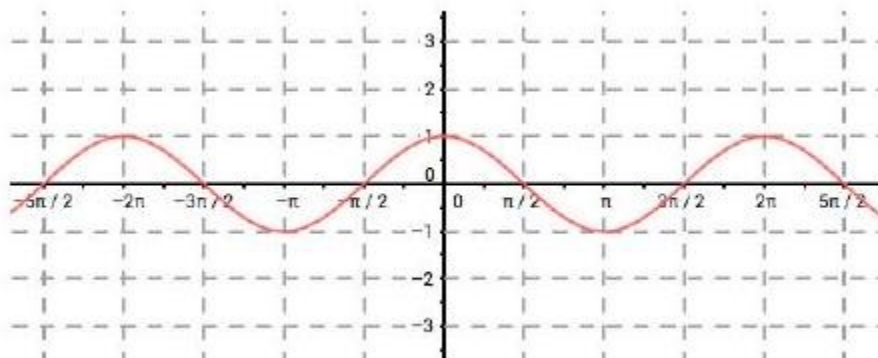
EX 2

Graph each of these.

$$y = \sin(2x)$$



$$y = \cos\left(\frac{1}{2}x\right)$$



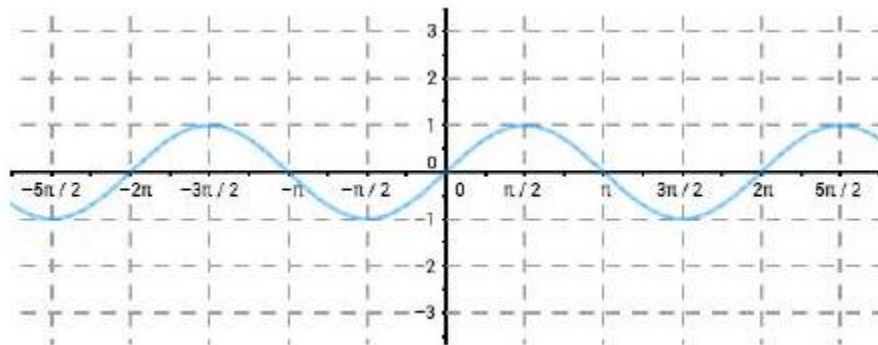
$$y = \sin(x - h)$$

- Horizontal shift (phase shift) =

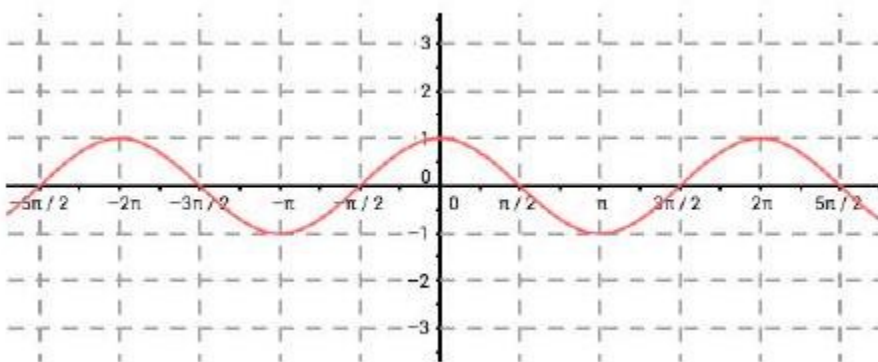
EX 3

Graph each of these.

$$y = \sin(x + \pi)$$



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



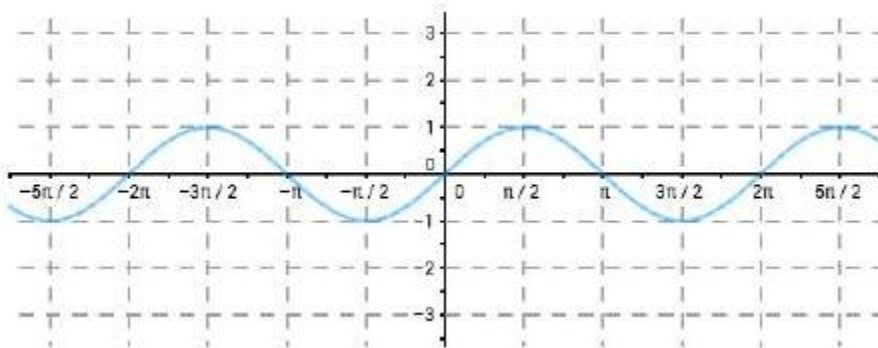
$$y = \sin(b(x - h))$$

- Period =
- Horizontal shift =

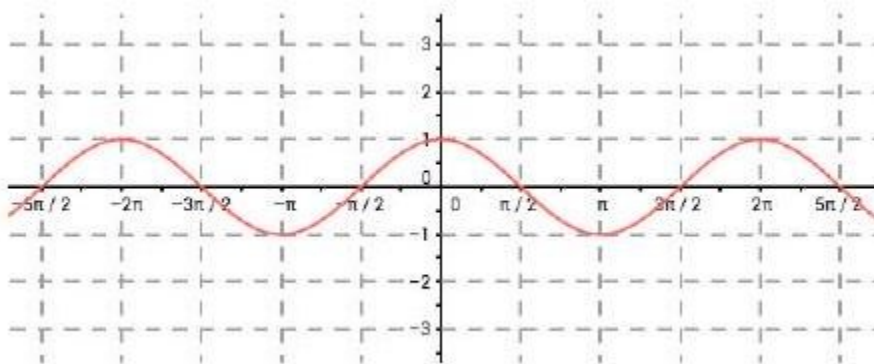
EX 4

Graph each of these.

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



$$y = \cos\left(\left(\frac{1}{2}\right)x + \frac{\pi}{2}\right)$$



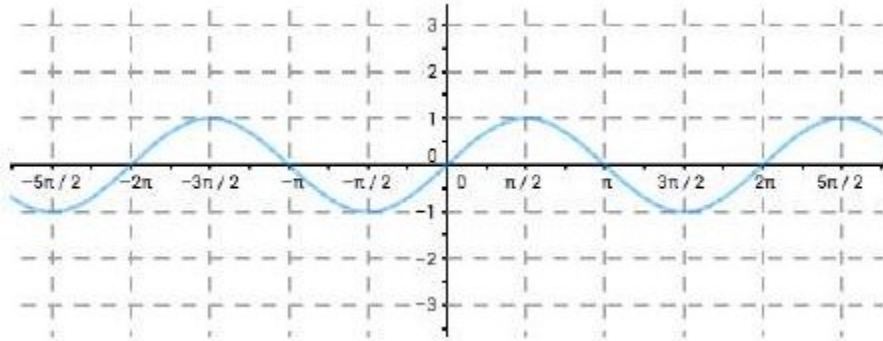
$$y = \sin(x) + k$$

Vertical Shift:

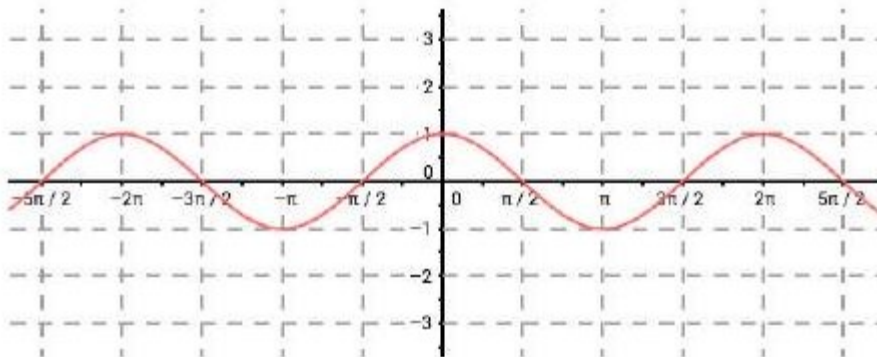
EX 5

Graph each of these.

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



$$y = \cos(x) + 1$$



So, when we graph a sine or cosine function there are these things to consider:

- Amplitude
- Period
- Phase shift (horizontal)
- Vertical shift

EX 6

List the transformations of this function.

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

- Amplitude
- Period
- Phase shift (horizontal)
- Vertical shift

EX 7

List the transformations of this function. $f(x) = -2\sin(4x - \pi) - 2$.

- Amplitude
- Period
- Phase shift (horizontal)
- Vertical shift

EX 8

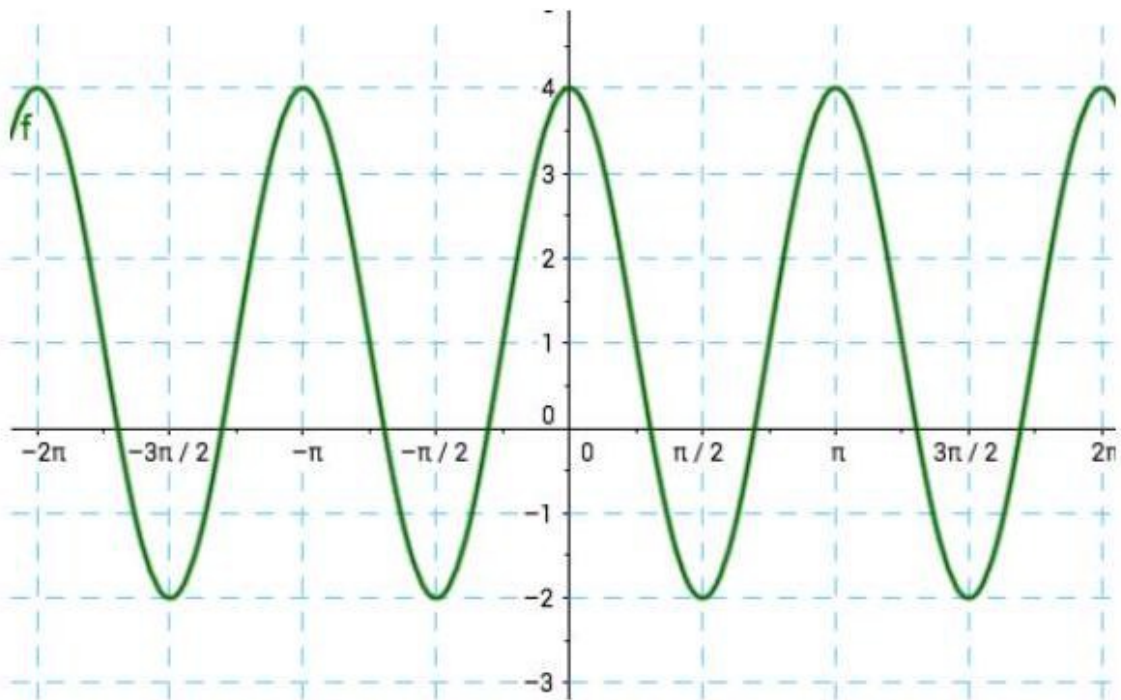
Analyze the transformations and write a function equation of this graph using the cosine function and then one using the sine function.

Period:

Amplitude:

Horizontal shift:

Vertical shift:



Here are some applets in case you want to play with the transformation variables.

www.analyzemath.com/trigonometry/sine.htm

<http://tube.geogebra.org/student/m45354?mobile=true>

Here are instructions and the equation format from the text for graphing a periodic (sinusoidal) function.

For $\omega > 0$, the functions

$$C(x) = A\cos(\omega x + \phi) + B$$

and

$$S(x) = A\sin(\omega x + \phi) + B$$

- have period $\frac{2\pi}{\omega}$
- have amplitude $|A|$
- have phase shift $-\frac{\phi}{\omega}$
- have vertical shift B