CHAPTER 14: GRAPHING TRIGONOMETRIC FUNCTIONS

What the basic Sine function represents

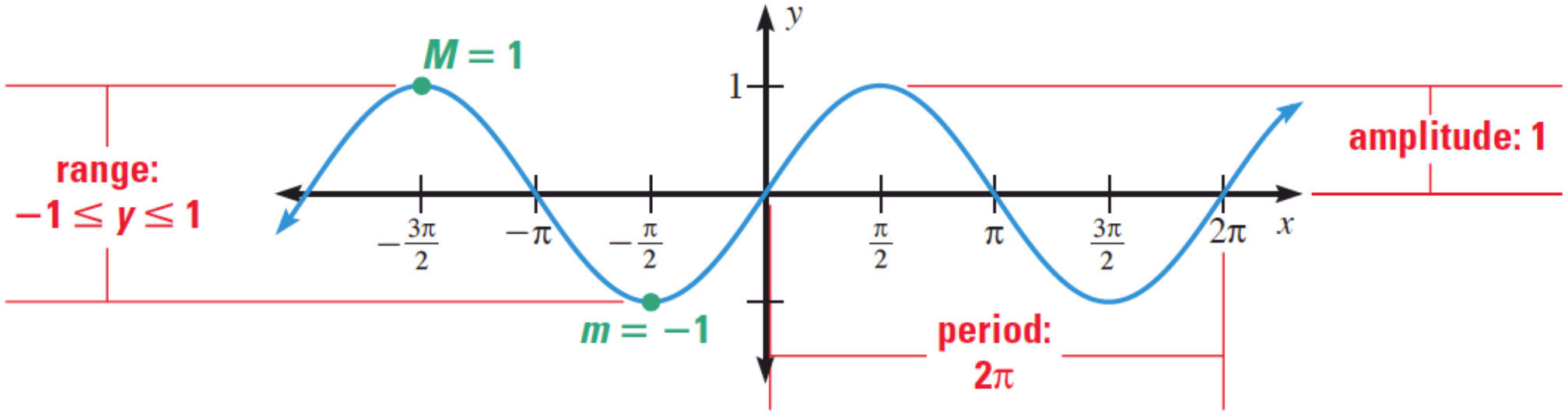
If you are following a point going around on a circle, sine tracks the y-value of the point.

Demo: https://www.desmos.com/calculator/b8tjkyjesu

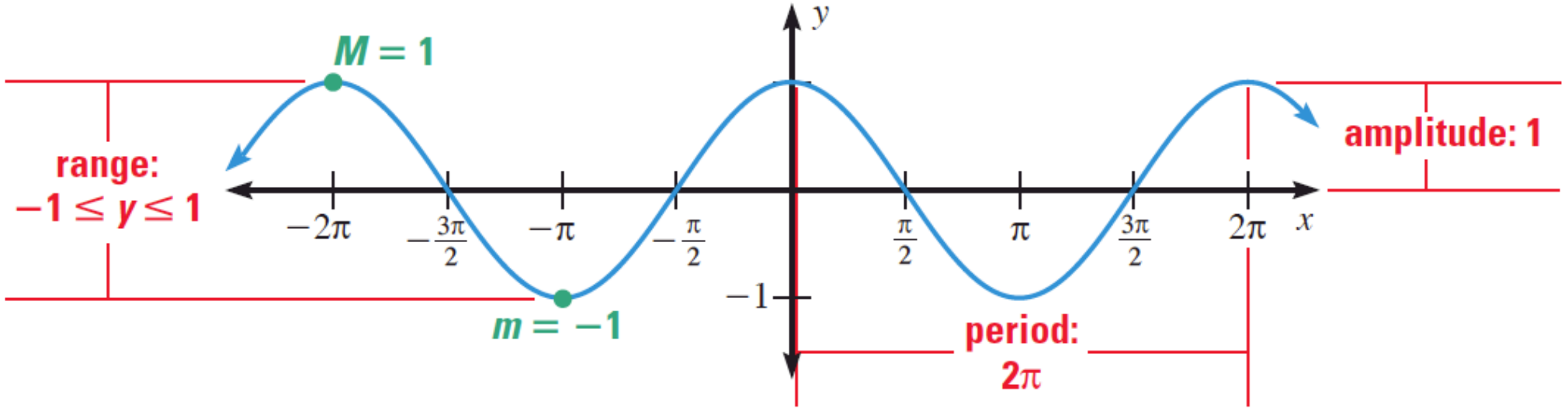
What the basic Cosine function represents

If you are following a point going around on a circle, cosine tracks the x-value of the circle.

Demo: https://www.desmos.com/calculator/eouprsrtuc



Graph of $y = \sin x$



Graph of $y = \cos x$

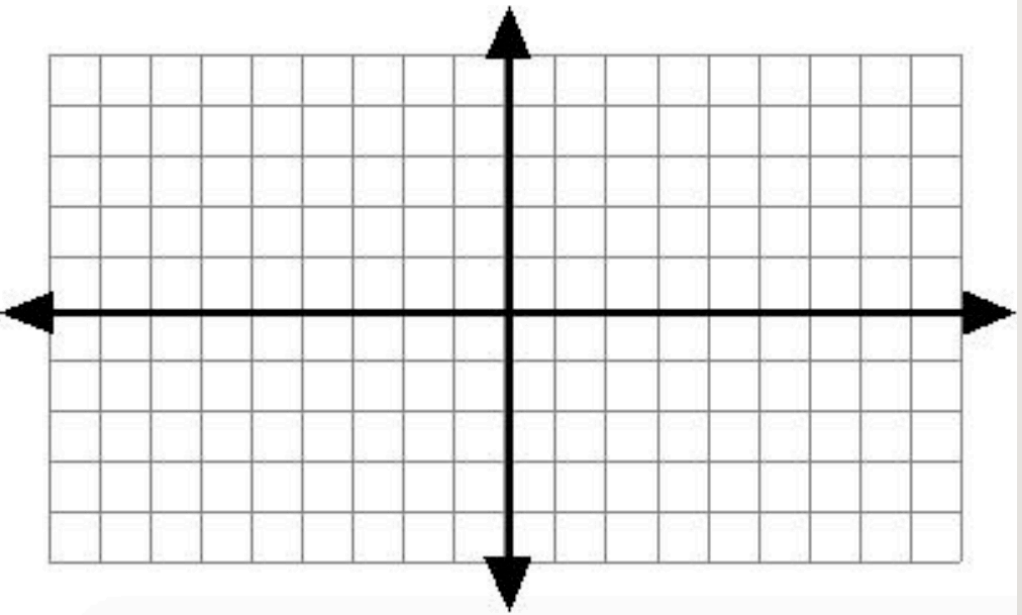
Characteristics of basic sine and cosine functions

- Domain: $\mathbb{R}$
- Range: $-1 \leq y \leq 1$ for basic function.
- Functions are **periodic**, sine and cosine have a period of 2π.
- Has a max of 1 and min of -1.
- The **amplitude** is half the distance between the max and min.
- Sine starts at the midline, cosine starts at a max or min.

Graphing basic Sine and Cosine Functions.

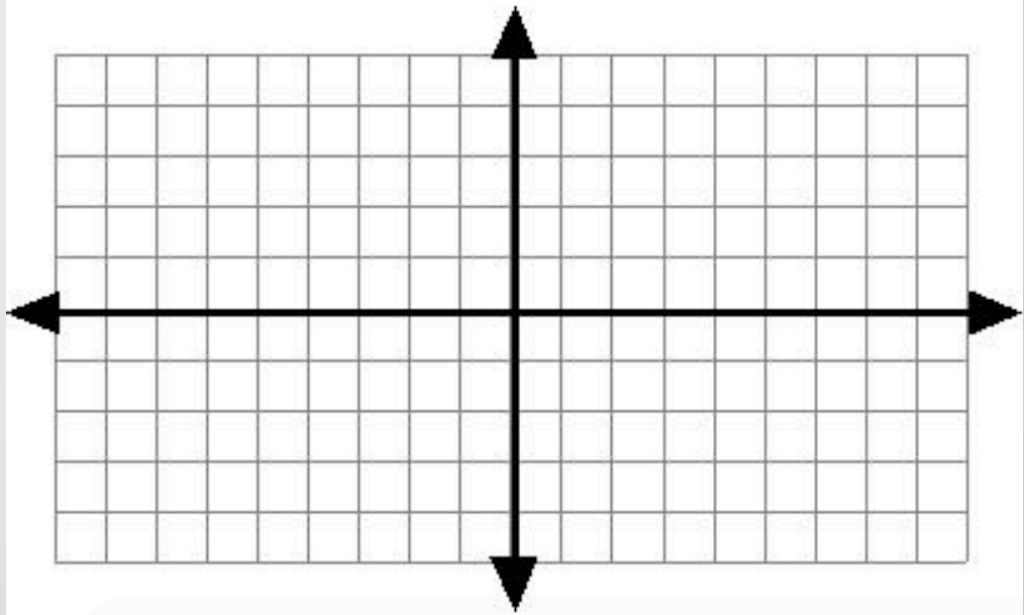
$y = \sin(x)$

Period:
Midline:
Max line:
Min line:
Cycle start:
Cycle End:



$y = \cos(x)$

Period:
Midline:
Max line:
Min line:
Cycle start:
Cycle End:



Transformed Sine and Cosine Functions

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

a:

b:

$y = a \cos b(x - h) + k$

h:

k:

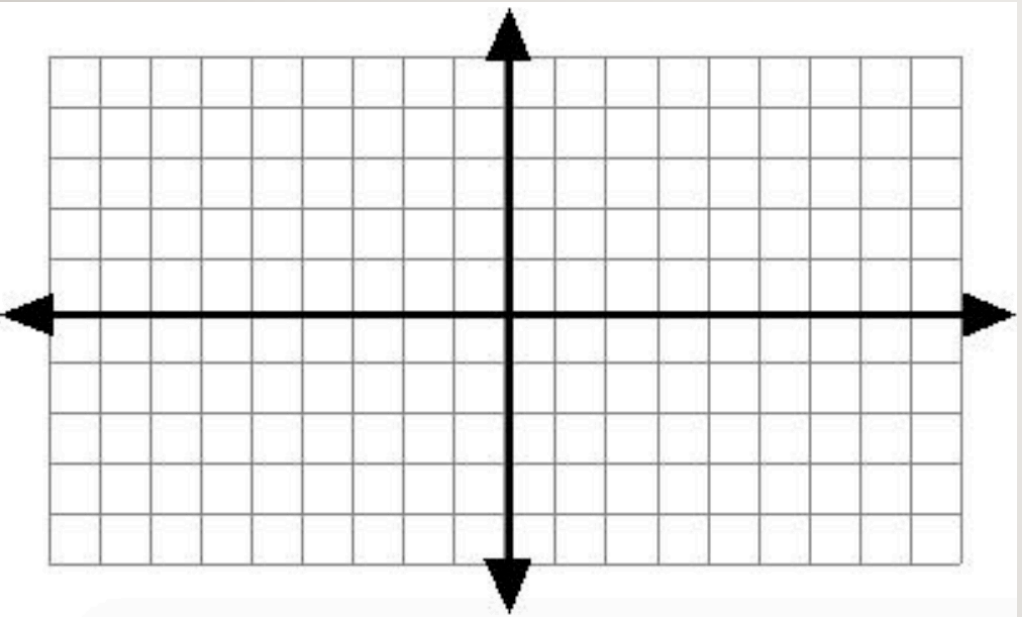
Steps to Graph Transformed Sine and Cosine Functions

1) Determine the period: $P = \frac{2\pi}{|b|}$. Use it to label the x-axis.
2) Determine the midline: $y = k$ and draw it.
3) Determine the max and min lines: $y = k + a$ and $y = k - a$ and draw them.
4) Determine starting point: $(0 + h, k)$ for sine and $(0 + h, k \pm a)$ for cos (do this visually).
5) Draw the point one period later.
6) Figure out if you are going up or down first. Draw the mid-period and quarter /3-quarter period points.
7) Draw the curve.

Graphing Sine and Cosine functions with amplitude change

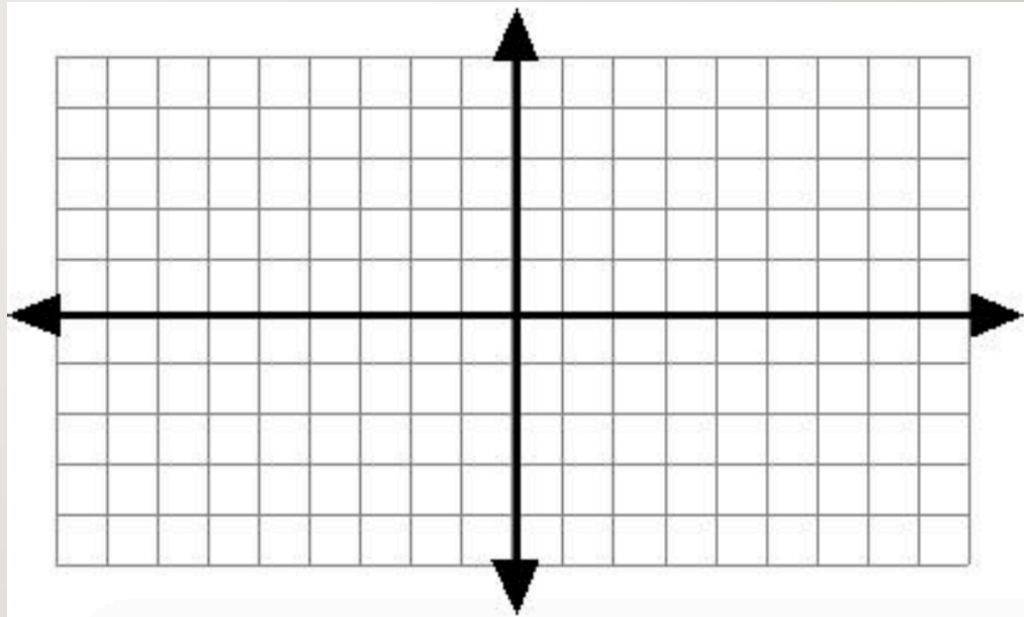
$y = 2\sin(x)$

Period:
Midline:
Max line:
Min line:
Cycle start:
Cycle End:



$y = -2\cos(x)$

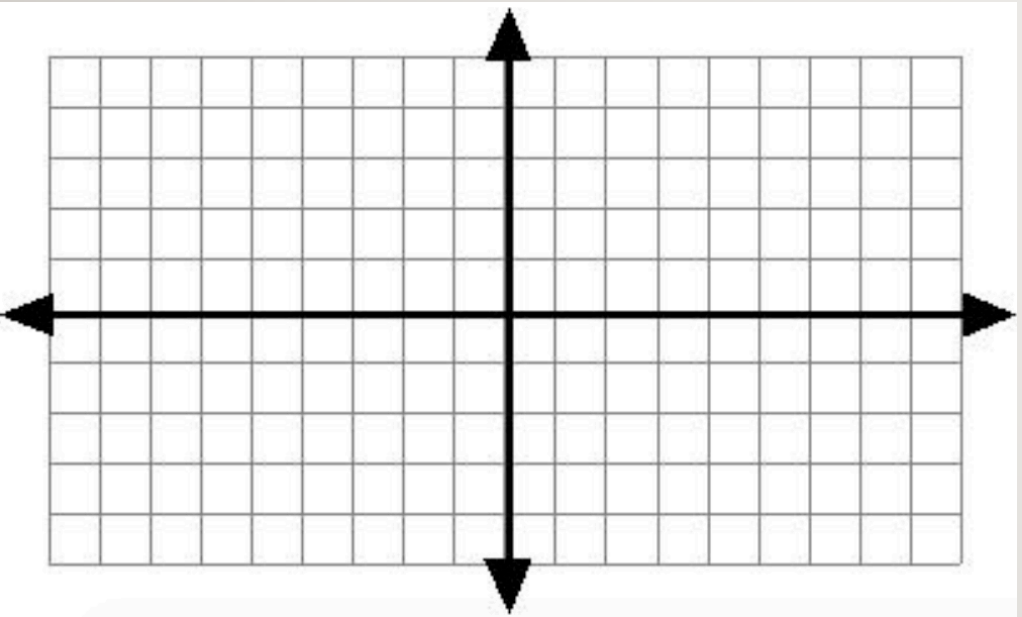
Period:
Midline:
Max line:
Min line:
Cycle start:
Cycle End:



Graphing Sine and Cosine functions with period change

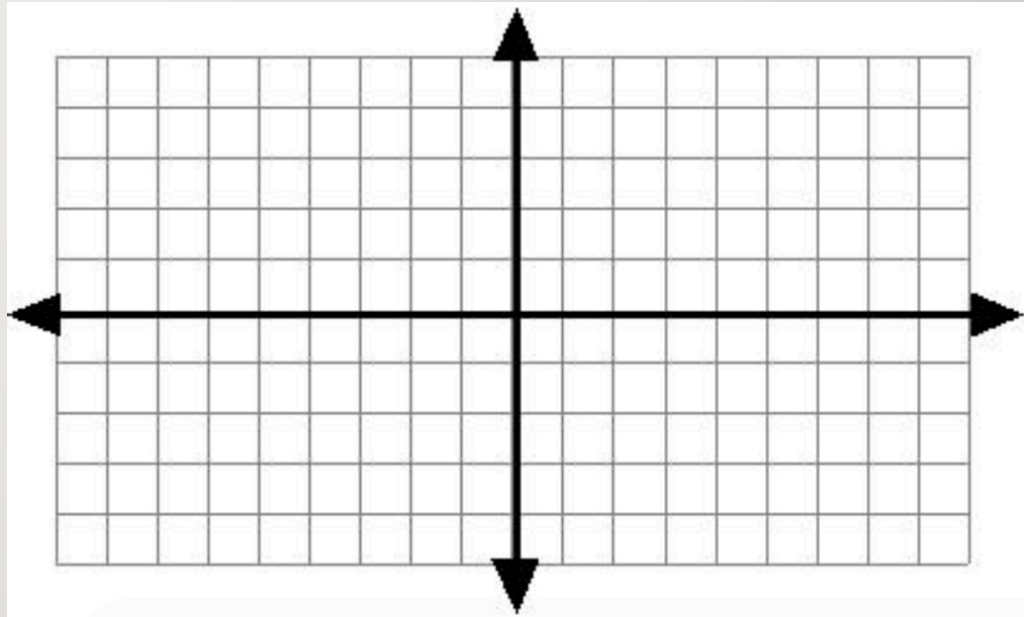
$y = \sin(2x)$

Period:
Midline:
Max line:
Min line:
Cycle start:
Cycle End:



$y = \cos(\pi x)$

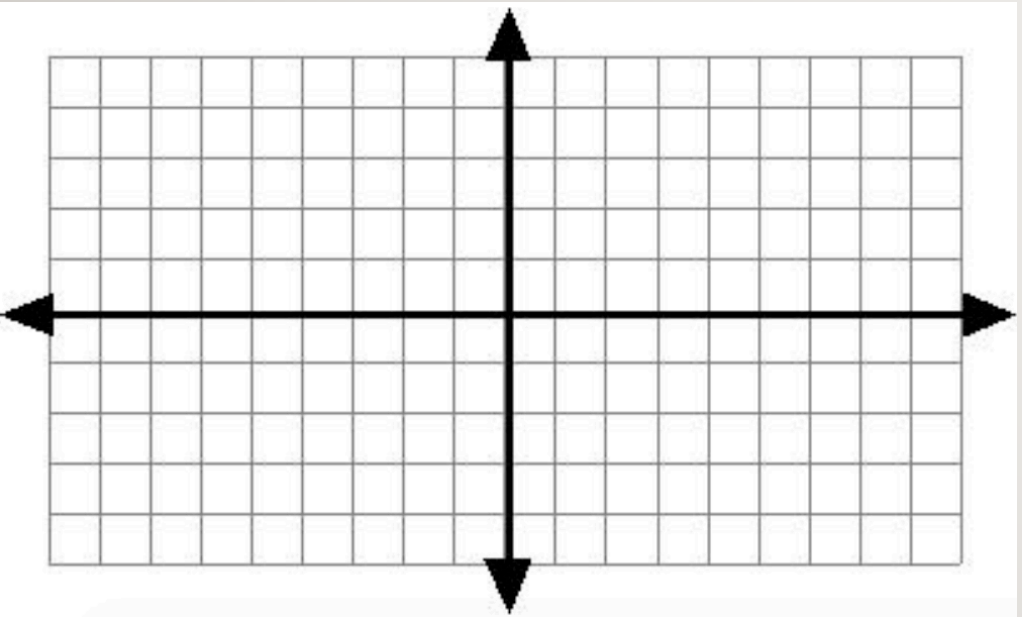
Period:
Midline:
Max line:
Min line:
Cycle start:
Cycle End:



Graphing Sine and Cosine functions with vertical shift

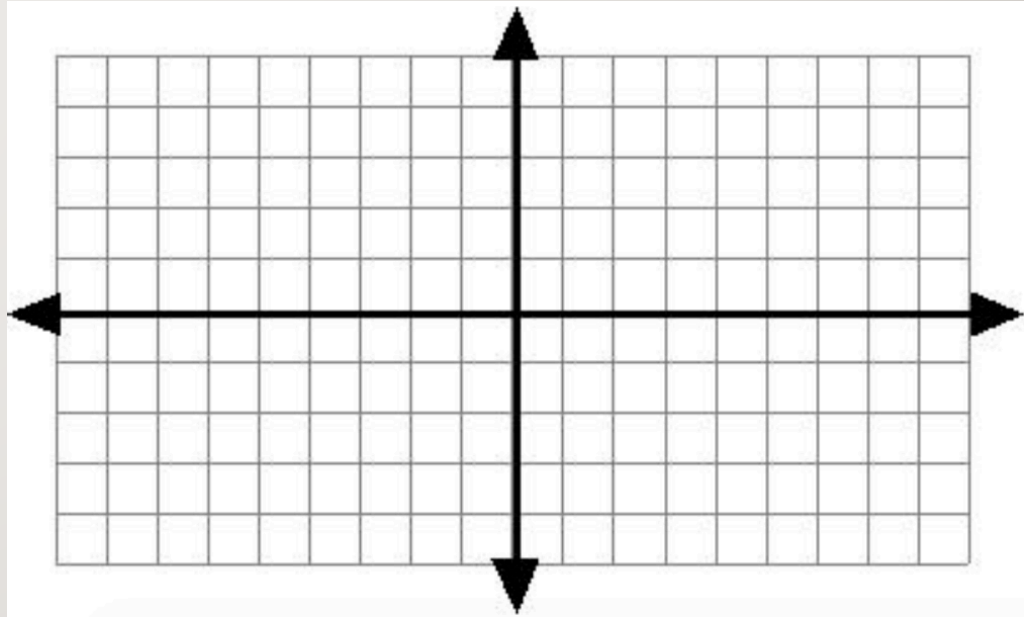
$y = \sin(x) + 3$

Period:
Midline:
Max line:
Min line:
Cycle start:
Cycle End:



$y = \cos(x) - 2$

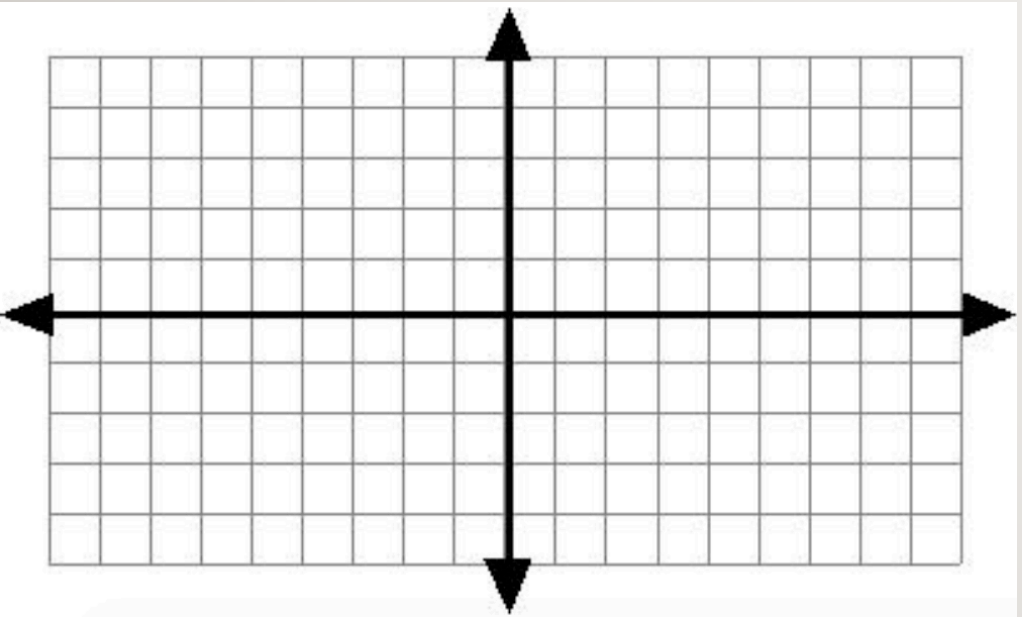
Period:
Midline:
Max line:
Min line:
Cycle start:
Cycle End:



Graphing Sine and Cosine functions with phase shift

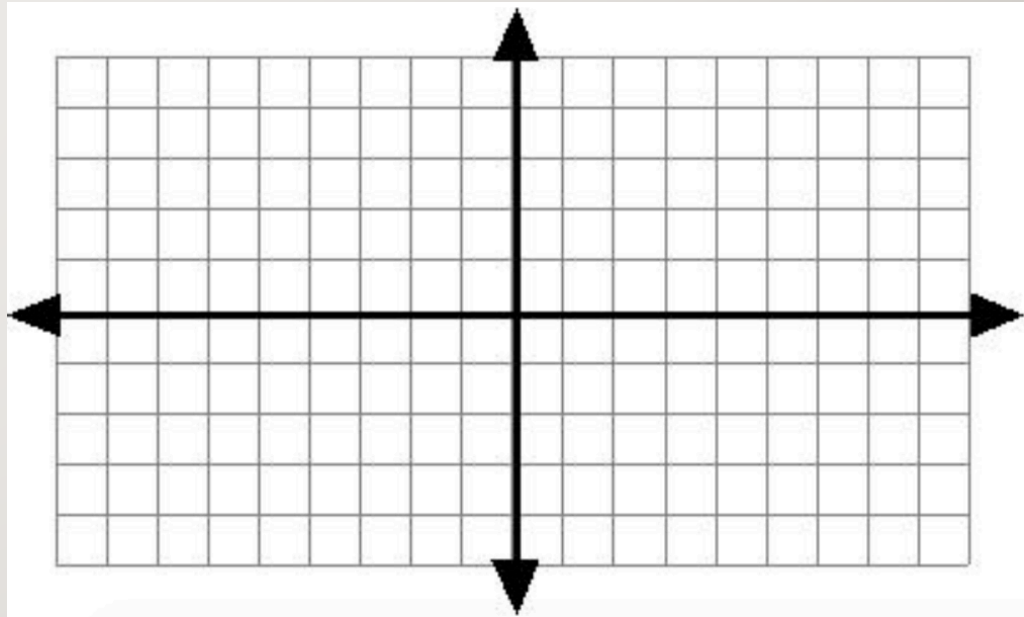
$$y = \sin(x - \frac{\pi}{2})$$

Period:
Midline:
Max line:
Min line:
Cycle start:
Cycle End:



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

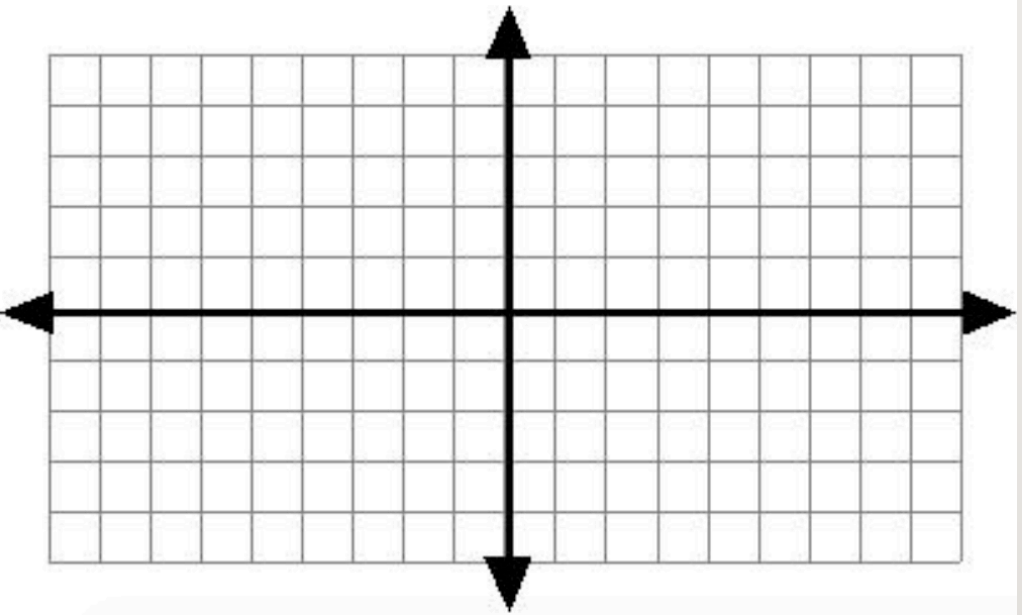
Period:
Midline:
Max line:
Min line:
Cycle start:
Cycle End:



Graphing Sine and Cosine functions – all parameters

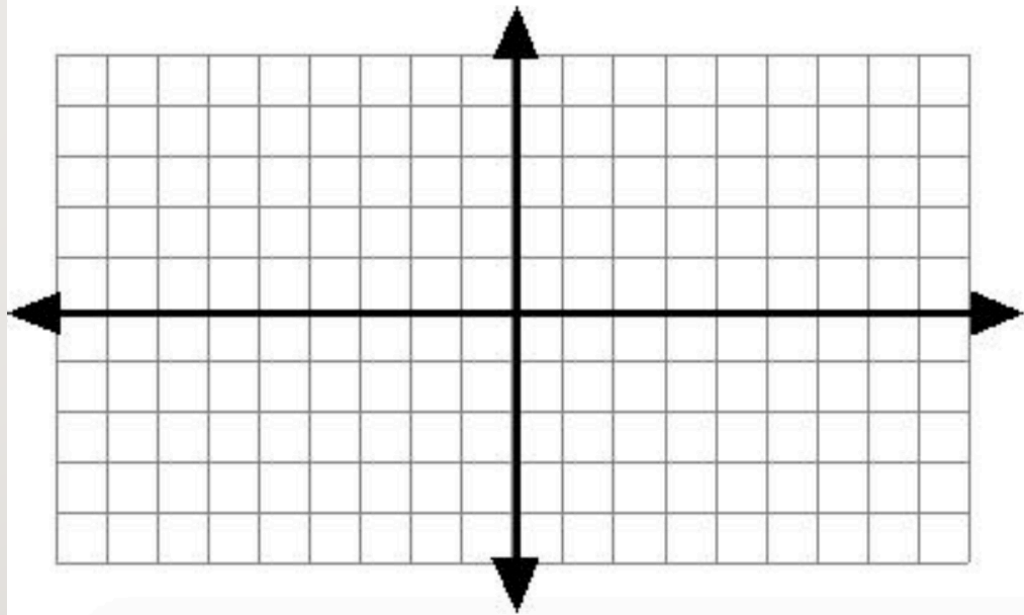
$$y = 3\sin 0.5\left(x - \frac{\pi}{2}\right) + 1$$

Period:
Midline:
Max line:
Min line:
Cycle start:
Cycle End:



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

Period:
Midline:
Max line:
Min line:
Cycle start:
Cycle End:



What the basic Tangent function represents

If you are following a point going around on a circle, tangent tracks the ratio of the y-value over the x-value of the point.

Demo: https://www.desmos.com/calculator/n9aeestsd8

Characteristics of sine and cosine functions

- Period is $\frac{2\pi}{|b|}$
- Vertical asymptotes at odd multiples of $\frac{\pi}{2|b|}$.