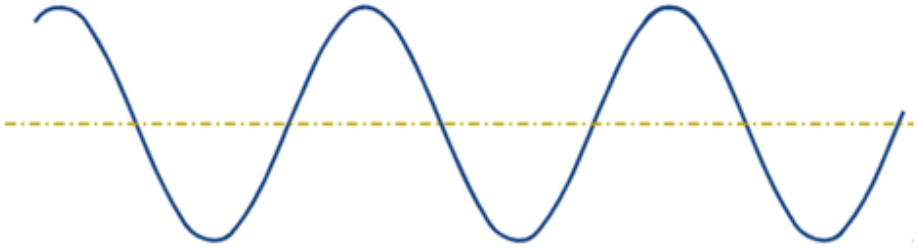
Graphing Sine and its BFF

Some functions (like Sine and Cosine) repeat forever and are called Periodic Functions.

Go ahead and graph Sine in your calculator you will get something like this.



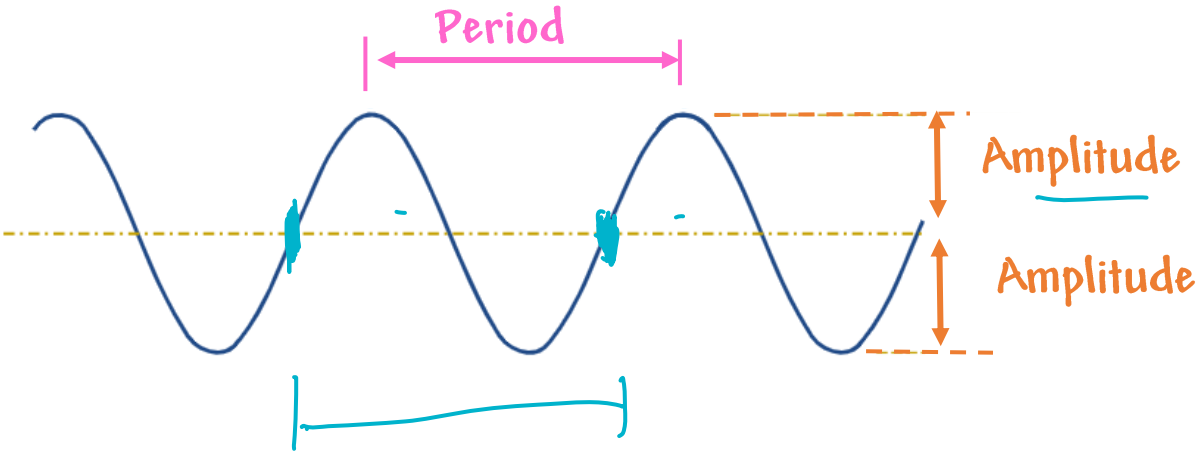
Click Here

Trigonometry Animated Gif's

There are a number of items on this graph that we want to talk about

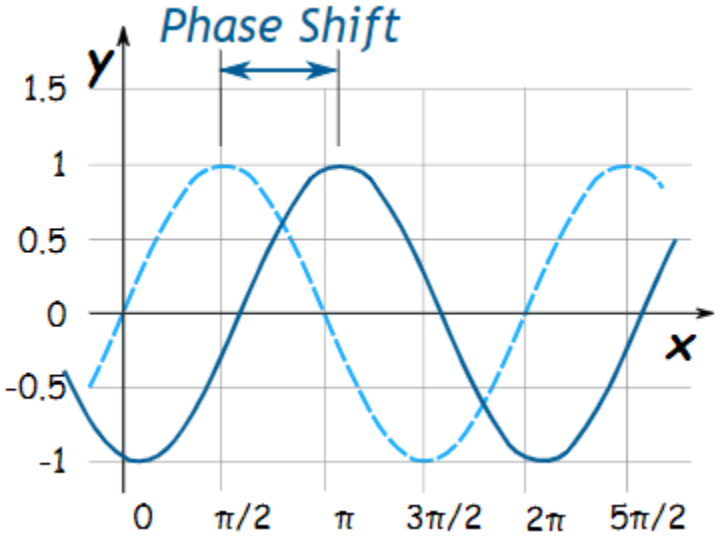
1 **The Period goes from one peak to the next (or from any point to the next matching point)**

Sine (and Cosecant) has period 2π Cosine (and Secant) has period 2π



2 **The Amplitude is the height from the center line to the peak (or to the trough).**

3 **The Phase Shift is how far the function is shifted horizontally from the usual position.**

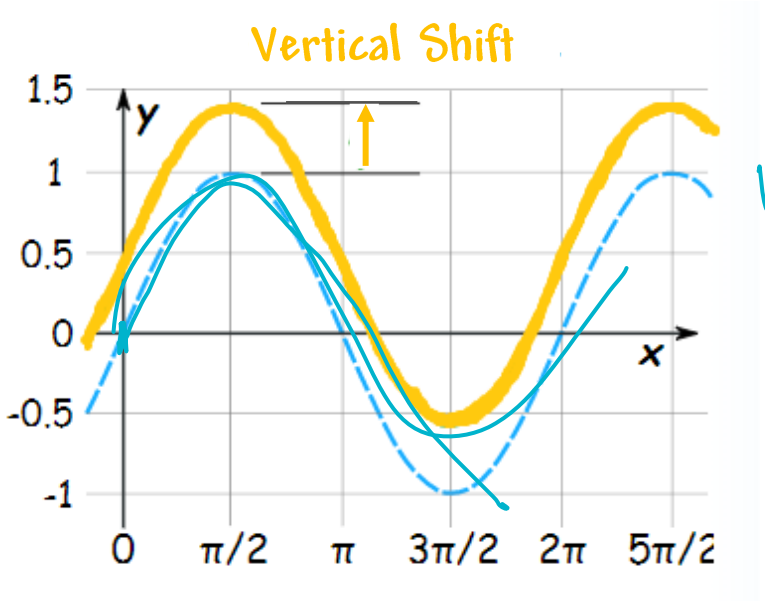


Horizontal shift

+ move left

− move right

4 **The Vertical Shift is how far the function is shifted vertically from the usual position.**



We can have all of these items in one equation so instead of graphing

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

We have this:

$$f(x) = A\sin(Bx - C) + D$$

That's a lot of letters, but don't worry you can figure this out.

Check it Out:

Play with the graph found at the link below and list what the letters do

https://www.desmos.com/calculator/tl0pnple1i

A: How high the peaks are / how low the valleys are
* Plus when A < 0 (negative) the graph flips over x-axis

B: The # of waves in one period
B is larger = more waves
B is smaller = less waves.

C: Horizontal shift

D: Vertical shift

Each of the values A, B, C and D all help to find things about the graph

$$f(x) = A\sin(Bx - C) + D$$

Amplitude:

How high the graph goes (If A is negative it flips the graph also)

Overall Period:

How long it takes to do a complete wave

Phase Shift:

Moving the graph left or right

Vertical Shift:

Moving the graph up or down

Check it Out: $A\sin(Bx-C)+D$

$$f(x) = -2\sin(4x-2\pi)+3$$

$A = -2$ $B = 4$ $C = 2\pi$ $D = 3$

Amplitude $= |A| = |-2| = 2$

Height of wave will be 2, because $A=-2$ the graph will be flipped over the x-axis

Overall Period $= \frac{\text{period}}{B} = \frac{2\pi}{4} = \frac{\pi}{2}$

One complete wave will happen in length π/2

means one wave (1 peak, 1 valley) will be done in length $\pi/2$

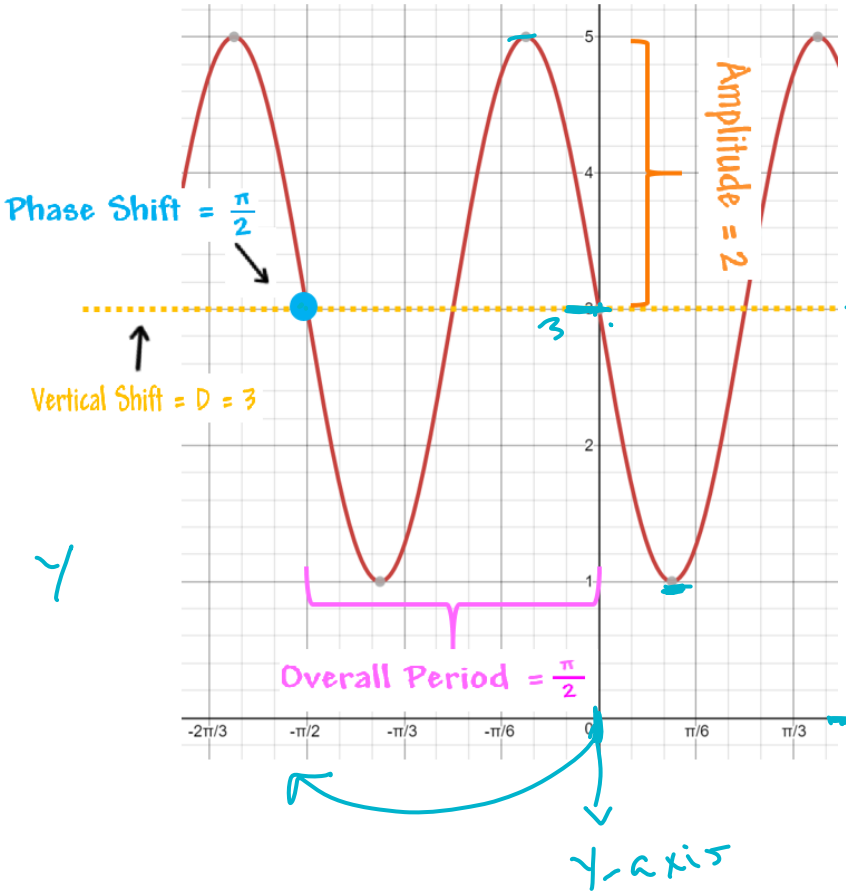
Phase Shift $= \frac{C}{B} = \frac{2\pi}{4} = \frac{\pi}{2}$

The graph will begin the wave at x = π/2

Horizontal movement

Vertical Shift $= D = 3$

The graph will shift up 3 units



horizontal

$\sin\theta = \frac{y}{1} = y$

$\csc\theta = \frac{1}{y}$

x axis

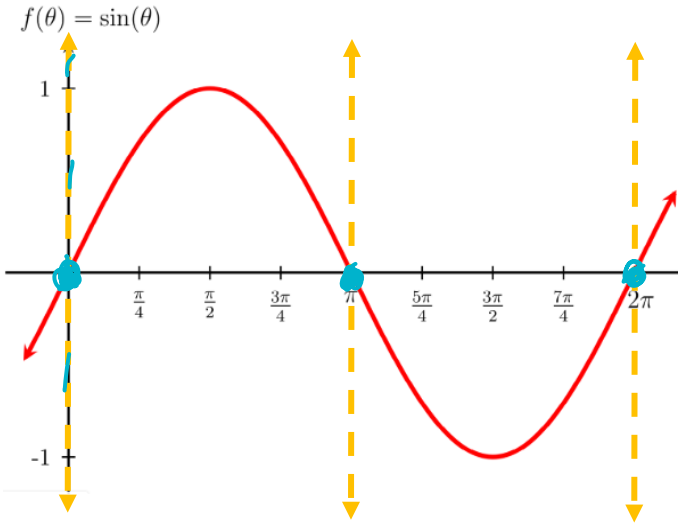
y-axis

So what about Sine's best friend… Cosecant what does it look like?

We know $\csc\theta = \frac{1}{y}$

What happens when y=0???

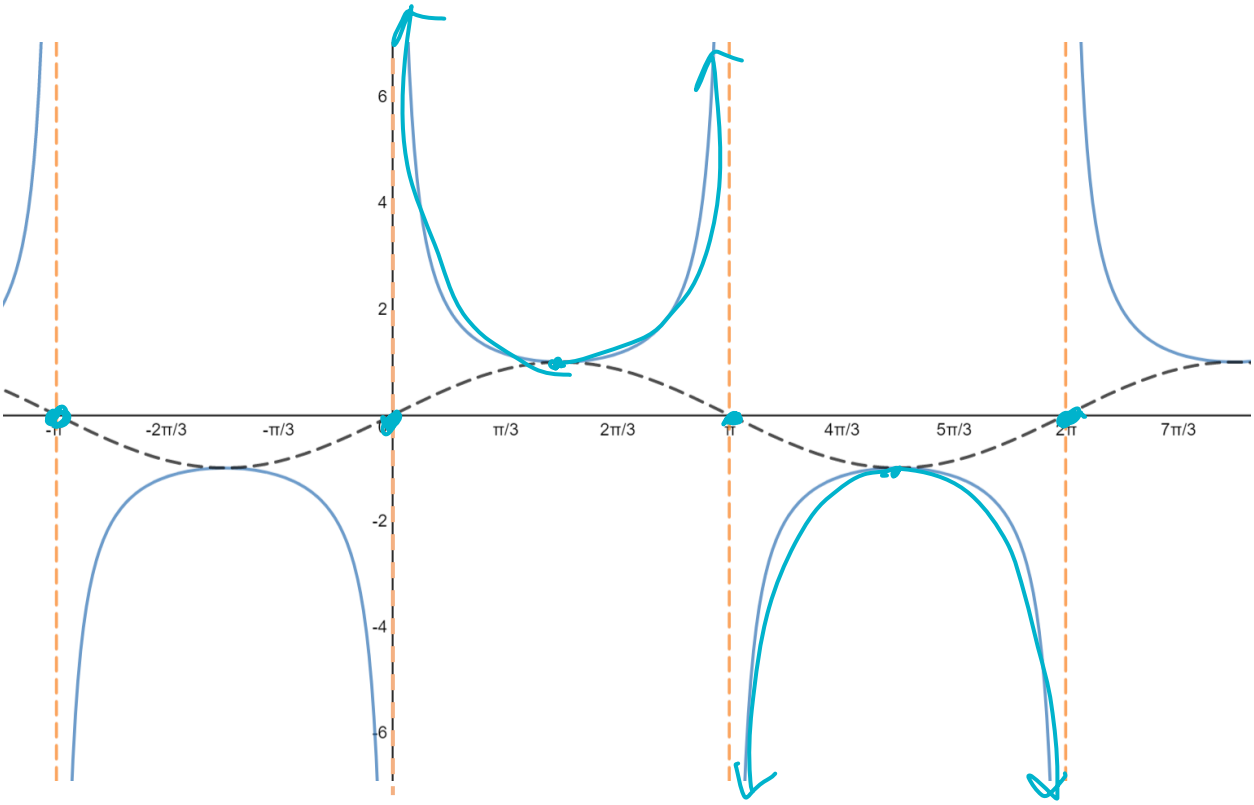
Cosecant is UNDEFINED



Everywhere $\sin\theta = 0$ **then** $\csc\theta = \text{undefined}$

The yellow dashed lines are where cosecant is undefined which means it DOES NOT EXIST

Ok so let's take what we have left and flip each piece



Ok that's weird but yup it's definitely flipped.

Sine is the black line, yellow dashed lines are where Sine = 0 and the blue lines are Cosecant