Transforming Trig Functions

The trig function: $y = sin\theta$ can be changed to something as complex as: $y = Asin(B(\theta - C)) + D$

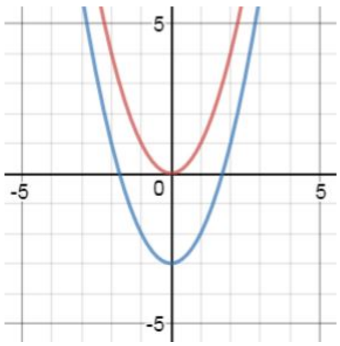
But what do each of those changes do to the graph?

Luckily, we've already learned what they do.

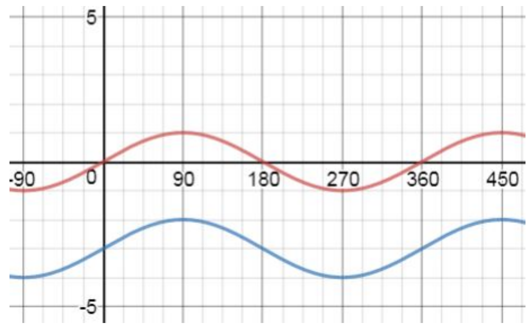
Old School: (original = red - transformed = blue)

D:

Transform $y = x^2$ to $y = x^2 - 3$



Transform $y = sinx$ to $y = sinx - 3$



Subtracting 3 (on the outside) makes the graphs shift down 3

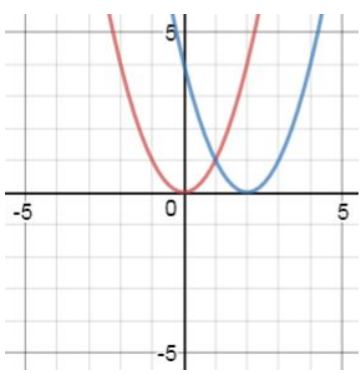
For the sine graph, this affects the: amplitude (Y or **N**) period (Y or **N**) midline (**Y** or N)

Result: The midline = D

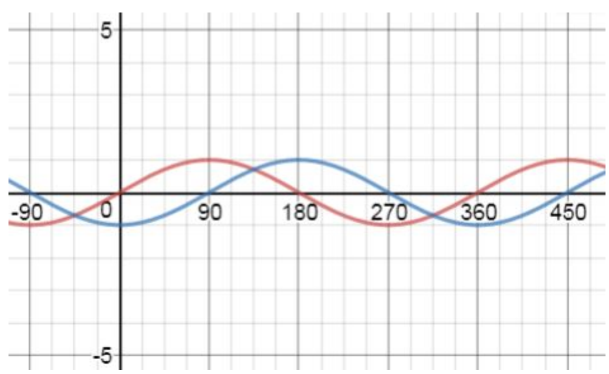
Note: These results apply for cos(x) and tan(x) as well

C:

Transform $y = x^2$ to $y = (x - 2)^2$



Transform $y = sinx$ to $y = \sin(x - 90°)$



Subtracting 90 (on the inside) makes the graph shifts the graph to the left 90.

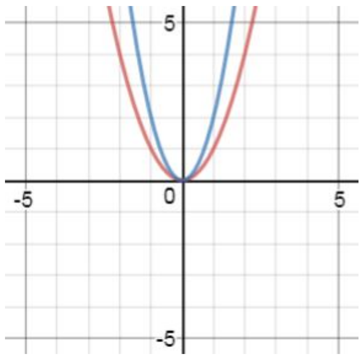
For the sine graph, this affects the: amplitude (Y or **N**) period (Y or **N**) midline (Y or **N**)

Result: A horizontal shift of a trig function is called a "phase shift".

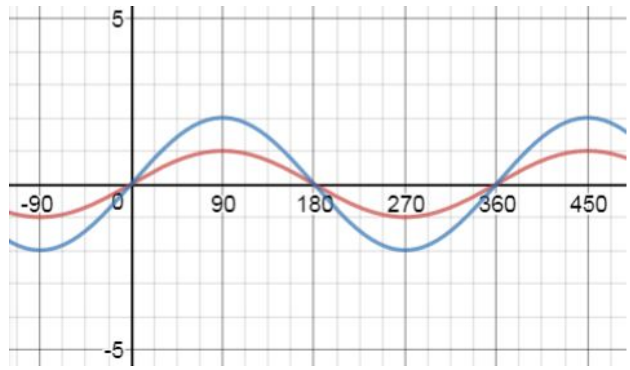
The phase shift = C Note: sin(x – C) has a positive p.s. sin(x + C) is a negative p.s.

A:

Transform $y = x^2$ to $y = 2x^2$



Transform $y = sinx$ to $y = 2sinx$



Multiplying by 2 (on the outside) makes the graphs stretch in the y-direction.

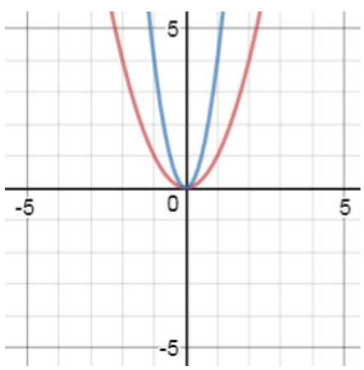
For the sine graph, this affects the: amplitude (Y or N) period (Y or N) midline (Y or N)

Result: The amplitude of sin(x), the amplitude of 2sin(x) is 2. The amplitude of 3sin(x) is 3, so…

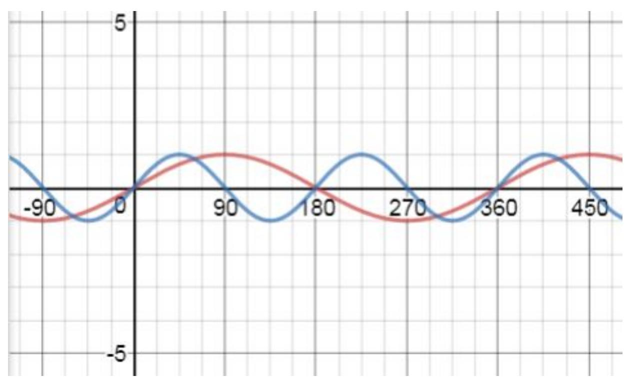
The amplitude = A

B:

Transform $y = x^2$ to $y = (2x)^2$



Transform $y = sinx$ to $y = sin2x$



Multiplying by 2 (on the inside) makes the graphs ____

For the sine graph, this affects the: amplitude (Y or N) period (Y or N) midline (Y or N)

Result: The period of sin(x) is 360°. the period of sin(2x) is 180°, or half as much.

In general, for sin(Bx), the period is $\frac{360^\circ}{B}$ (or $\frac{2\pi}{B}$ for radians)

In our example, sin(2x), B=2. So the period is $\frac{360^\circ}{2} = 180^\circ$

Looking at the graph, sin(x) goes through one period from 0 to 360. Sin(2x) goes through 2 periods.

If you were graphing sin(4x), the graph would go up-down-up 4 times between 0 and 360.

Lastly: If A is negative, it is a reflection over the x-axis. If B is negative, it is a reflection over the y-axis.