Graphing Trigonometric Functions by using Transformations

$y = A\sin(Bx - C) + D$ **or factor out B so that** $y = A\sin B\left(x - \frac{C}{B}\right) + D$

Note: Sine could be replaced with any other trig function.

| A | = the absolute value of A, which indicates a **vertical stretch or shrink.**
For sine or cosine functions this is called the **amplitude** of the graph since it changes the height of the graph.

B – changes the **period** of the function. It **horizontally shrinks or stretches** the graph. (Our textbook uses this symbol ω instead of B; see sections 7.6 thru 7.8.)

$Period = \frac{2\pi}{|B|}$ *or* $\frac{2\pi}{\omega}$ This applies to sine, cosine, secant and cosecant since their usual period is 2л. The x-scale = Period/4.

[But for tangent or cotangent $Period = \frac{\pi}{|B|}$ *or* $\frac{\pi}{\omega}$ since the usual period is just л.]

C – **shifts or translates** the graph **to the right or the left** "C units".
This is called a **phase shift**.

If C > 0 then (x – C) means a shift of the graph to the right "C units" and
(x + C) means a shift of the graph to the left "C units".

D – shifts the graph **up or down** "D units". This is called a **vertical shift.**

If D > 0 then the graph moves up "D units" or if
D < 0 then the graph moves down "D units".

It helps to do these **transformations** in the order listed. That is, make the changes vertically and horizontally then do any phase shift. Do vertical shifts last.

Please refer to the pictures in the textbook that illustrate these concepts.