

## Transforming the Sine and Cosine Functions

**Equations:**  $y = \pm a \sin [\pm b(x - h)] + k$        $y = \pm a \cos[\pm b(x - h)] + k$

**Mapping Rule:**  $(x, y) \rightarrow \left( \pm \frac{1}{b}x + h, \pm ay + k \right)$

**Phase Shift (Horizontal Shift)** - the horizontal distance a function is moved ( $h$  value).

**Vertical Shift** - the vertical distance a function is moved ( $k$  value).

**Amplitude (Vertical Stretch Factor)** - half the vertical distance from the function's maximum value to its minimum value ( $a$  value).

**Horizontal Stretch Factor** - the factor by which a sinusoidal function's period changes; will increase or decrease the horizontal length of one wave.

**Period** - the period of a transformed sine or cosine function can be calculated using the following equations.

*Equations:*

$$Period = HSF \cdot 360^\circ$$

$$Period = HSF \cdot 2\pi$$

OR  $Period = \frac{1}{b} \cdot 360^\circ$

$$Period = \frac{1}{b} \cdot 2\pi$$