Recitation Handout 20: Formulas for Sinusoidal Functions
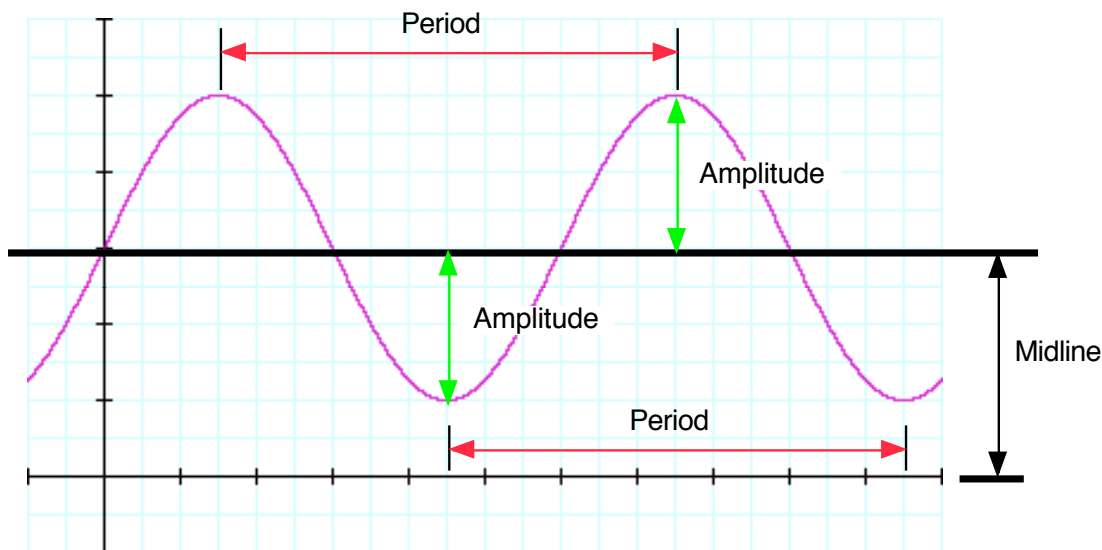
Definitions of Period, Amplitude and Midline

The three parameters that are the most important for describing a sinusoidal graph (and for creating a formula to match a sinusoidal graph) are:

- **Period:** The amount of time (or distance along the x-axis) that is required for one complete version of the wave-like pattern.

- **Midline:** The "average height" or center of the wave. This is the average of the highest and lowest y-values on the graph.

$$Midline = \frac{(\text{Highest y - value}) + (\text{Lowest y - value})}{2}$$

- **Amplitude:** This is the maximum amount that the wave can deviate from the midline.

$$Amplitude = \frac{(\text{Highest y - value}) - (\text{Lowest y - value})}{2}$$

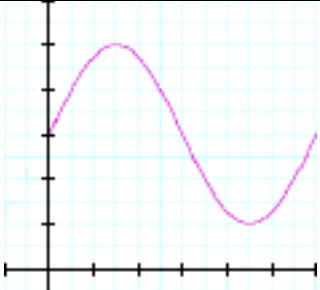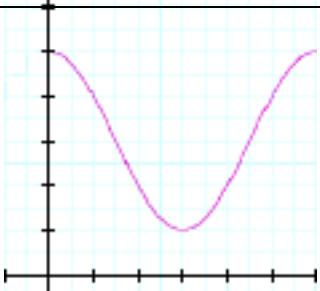**Choosing the correct trigonometric function**

There are four basic choices for the trigonometric function that you should use when creating a formula for a sinusoidal function. The best formula to use can be determined by carefully studying what the sinusoidal graph does as it sets out from $t = 0$ and moves left to right.

The four basic formulas for sinusoidal functions

A = amplitude

M = midline

P = period

If the graph resembles this …	Verbal description	The equation will be something like…
	Graph starts out at midline and heads up to maximum value	$f(x) = A \cdot \sin\left(\frac{2\pi}{P} \cdot x\right) + M$
	Graph starts out at midline and heads down to maximum value	$f(x) = -A \cdot \sin\left(\frac{2\pi}{P} \cdot x\right) + M$
	Graph starts out at maximum value and heads down to midline	$f(x) = A \cdot \cos\left(\frac{2\pi}{P} \cdot x\right) + M$
	Graph starts out at minimum value and heads up to midline	$f(x) = -A \cdot \cos\left(\frac{2\pi}{P} \cdot x\right) + M$