Trigonometry Review

Trigonometry deals with functions like sin and cos, which appear in many different sciences. In general, anytime a phenomenon exhibits a "wave-like" pattern, it can be described by some combination of sin and/or cos.

More specifically, $\cos(\theta)$ and $\sin(\theta)$ are the x and y values of the point on the unit circle with angle θ. For example,

Almost always we will measure angles in radians rather than degrees. To convert between them, one uses the formula (radians = degrees $*$ $\pi/180$). For example, 90 degrees = $90 * \pi/180 = \pi/2$ radians, or 60 degrees = $60 * \pi/180 = \pi/3$ radians.

Here are some common values of sin and cos:

θ	$\cos(\theta)$	$\sin(\theta)$
0	1	0
$30^0 = \pi/6$	$\sqrt{3}/2$	$1/2$
$45^0 = \pi/4$	$1/\sqrt{2}$	$1/\sqrt{2}$
$60^0 = \pi/3$	$1/2$	$\sqrt{3}/2$
$90^0 = \pi/2$	0	1

As we mentioned above, graphically, sin and cos look like waves. Here is the graph of $\sin(\theta)$:

and $\cos(\theta)$:

In addition to sin and cos, there are several other trigonometric functions which are defined in terms of sin and cos. They are:

$$\tan(\theta) = \frac{\sin(\theta)}{\cos(\theta)}, \quad \csc(\theta) = \frac{1}{\sin(\theta)},$$

$$\sec(\theta) = \frac{1}{\cos(\theta)}, \quad \cot(\theta) = \frac{1}{\tan(\theta)} = \frac{\cos(\theta)}{\sin(\theta)}$$

Finally, there are several identities which relate sin and cos. They are:

$$\sin^2(\theta) + \cos^2(\theta) = 1$$

$$1 + \tan^2(\theta) = \sec^2(\theta)$$

$$1 + \cot^2(\theta) = \csc^2(\theta)$$

$$\sin(2\theta) = 2\sin(\theta)\cos(\theta)$$

$$\cos(2\theta) = 2\cos^2(\theta) = 1 - 2\sin^2(\theta) = \cos^2(\theta) - \sin^2(\theta)$$