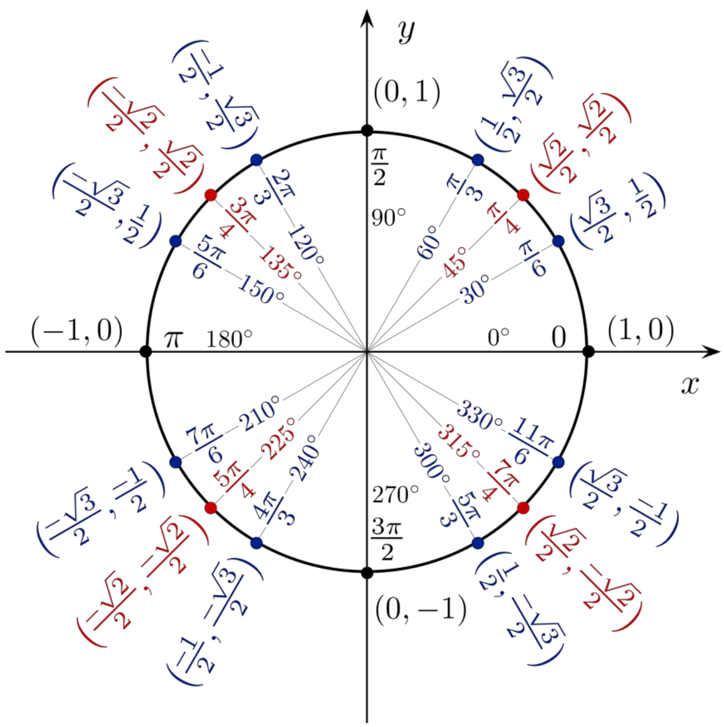
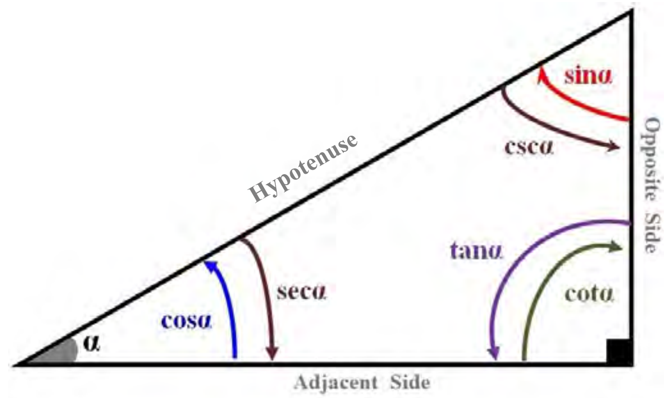
2π (radians) $\equiv 360° \equiv 1$ revolution $\qquad \theta = \dfrac{s}{r}$ (radians) $\qquad v = \dfrac{s}{t} = r\omega = r\dfrac{\theta}{t} \qquad \omega = \dfrac{\theta}{t} = \dfrac{v}{r} = \dfrac{s}{rt} = \dfrac{v\theta}{s}$

$$3600\ rev / minute = \frac{3600\ rev}{1\ min}\,\frac{2\pi\ (radians)}{1\ rev}\,\frac{1\ min}{60\ sec} = \frac{120\pi\ (radians)}{1\ sec}$$

$$r = \sqrt{\left(x_2 - x_1\right)^2 + \left(y_2 - y_1\right)^2} \qquad (x-h)^2 + (y-k)^2 = r^2$$

$\sin\theta = \dfrac{Opposite}{Hypotenuse} = \dfrac{opp}{hyp}$	$\cos\theta = \dfrac{Adjacent}{Hypotenuse} = \dfrac{adj}{hyp}$	$\tan\theta = \dfrac{opposite}{adjacent} = \dfrac{opp}{adj} = \dfrac{\sin\theta}{\cos\theta}$
$\csc\theta = \dfrac{hyp}{opp} = \dfrac{1}{\sin\theta}$	$\sec\theta = \dfrac{hyp}{adj} = \dfrac{1}{\cos\theta}$	$\cot\theta = \dfrac{adj}{opp} = \dfrac{\cos\theta}{\sin\theta} = \dfrac{1}{\tan\theta}$





$\cos^2\alpha + \sin^2\alpha = 1 \qquad 1 + \tan^2\alpha = \sec^2\alpha \qquad 1 + \cot^2\alpha = \csc^2\alpha$

$\cos(-\alpha) = \cos\alpha \qquad \sin(-\alpha) = -\sin\alpha \qquad \tan(-\alpha) = -\tan\alpha$

$\cos(90° - \alpha) = \sin\alpha \qquad \sin(90° - \alpha) = \cos\alpha \qquad \tan(90° - \alpha) = \cot\alpha$

$\cos(\alpha - \beta) = \cos\alpha\cos\beta + \sin\alpha\sin\beta$	$\sin(\alpha - \beta) = \sin\alpha\cos\beta - \cos\alpha\sin\beta$	$\tan(\alpha - \beta) = \dfrac{\tan\alpha - \tan\beta}{1 + \tan\alpha\tan\beta}$
$\cos(\alpha + \beta) = \cos\alpha\cos\beta - \sin\alpha\sin\beta$	$\sin(\alpha + \beta) = \sin\alpha\cos\beta + \cos\alpha\sin\beta$	$\tan(\alpha + \beta) = \dfrac{\tan\alpha + \tan\beta}{1 - \tan\alpha\tan\beta}$

Half-Angle: $\cos\left(\dfrac{\alpha}{2}\right) = \pm\sqrt{\dfrac{1+\cos\alpha}{2}} \qquad \sin\left(\dfrac{\alpha}{2}\right) = \pm\sqrt{\dfrac{1-\cos\alpha}{2}} \qquad \tan\left(\dfrac{\alpha}{2}\right) = \dfrac{\sin\alpha}{1+\cos\alpha} = \dfrac{1-\cos\alpha}{\sin\alpha}$

$a\sin x + b\cos x = k\sin(x+\alpha)$ where $k = \sqrt{a^2+b^2}$, $\sin\alpha = \dfrac{b}{\sqrt{a^2+b^2}}$, and $\cos\alpha = \dfrac{a}{\sqrt{a^2+b^2}}$

Double-Angle

$\cos 2\alpha = \cos^2\alpha - \sin^2\alpha$ $= 1 - 2\sin^2\alpha$ $= 2\cos^2\alpha - 1$	$\sin 2\alpha = 2\sin\alpha\cos\alpha$	$\tan 2\alpha = \dfrac{2\tan\alpha}{1-\tan^2\alpha}$
$\cos^2\alpha = \dfrac{1+\cos 2\alpha}{2}$	$\sin^2\alpha = \dfrac{1-\cos 2\alpha}{2}$	$\tan^2\alpha = \dfrac{1-\cos 2\alpha}{1+\cos 2\alpha}$

Product-to-Sum:

$\sin\alpha\cos\beta = \frac{1}{2}\left[\sin(\alpha+\beta)+\sin(\alpha-\beta)\right]$	$\cos\alpha\sin\beta = \frac{1}{2}\left[\sin(\alpha+\beta)-\sin(\alpha-\beta)\right]$
$\cos\alpha\cos\beta = \frac{1}{2}\left[\cos(\alpha+\beta)+\cos(\alpha-\beta)\right]$	$\sin\alpha\sin\beta = \frac{1}{2}\left[\cos(\alpha-\beta)-\cos(\alpha+\beta)\right]$

Sum-to-Product:

$\cos x + \cos y = 2\cos\left(\frac{x+y}{2}\right)\cos\left(\frac{x-y}{2}\right)$	$\sin x + \sin y = 2\sin\left(\frac{x+y}{2}\right)\cos\left(\frac{x-y}{2}\right)$
$\cos x - \cos y = -2\sin\left(\frac{x+y}{2}\right)\sin\left(\frac{x-y}{2}\right)$	$\sin x - \sin y = 2\cos\left(\frac{x+y}{2}\right)\sin\left(\frac{x-y}{2}\right)$

Law of Sines: $\dfrac{a}{\sin A} = \dfrac{b}{\sin B} = \dfrac{c}{\sin C}$ $\qquad$ $\dfrac{\sin A}{a} = \dfrac{\sin B}{b} = \dfrac{\sin C}{c}$

Law of Cosines:

$a^2 = b^2 + c^2 - 2bc\cos A$	$A = \cos^{-1}\left(\dfrac{b^2+c^2-a^2}{2bc}\right)$
$b^2 = a^2 + c^2 - 2ac\cos B$	$B = \cos^{-1}\left(\dfrac{a^2+c^2-b^2}{2ac}\right)$
$c^2 = a^2 + b^2 - 2ab\cos C$	$C = \cos^{-1}\left(\dfrac{a^2+b^2-c^2}{2ab}\right)$

Vectors:

Magnitude: $\quad |V| = \sqrt{a^2+b^2}$	*Angle*: $\cos\theta = \dfrac{U \bullet V}{|U||V|}$
Dot Product: $U \bullet V = (ai+bj)\bullet(ci+dj) = ac+bd$	

$z = r(\cos\theta + i\ \sin\theta) = r\ cis\theta$ $\qquad$ $r = \sqrt{x^2+y^2}$ $\qquad$ $\cos\theta = \frac{x}{r},\ \ \sin\theta = \frac{y}{r},\ \ and\ \ \tan\theta = \frac{y}{x}$

$\left(r_1 cis\theta_1\right)\left(r_2 cis\theta_2\right) = r_1 r_2 cis\left(\theta_1+\theta_2\right)$ $\qquad$ $\dfrac{r_1 cis\theta_1}{r_2 cis\theta_2} = \dfrac{r_1}{r_2} cis\left(\theta_1-\theta_2\right)$

De Moivre's *Theorem*: $\left[rcis\theta\right]^n = r^n\left(cisn\theta\right)$ $\qquad$ $\left[rcis\theta\right]^{1/n} = \sqrt[n]{r}cis\alpha$ $\qquad$ $\alpha = \dfrac{\theta}{n} + \dfrac{360°k}{n}$

The graphs of $y = A\sin(Bx+C)+D$ and $y = A\cos(Bx+C)+D$, where $B > 0$, will have the following characteristics:

Amplitude = $|A|$ Period = $\dfrac{2\pi}{|B|}$ Phase Shift $= \varphi = -\dfrac{C}{B}$ One cycle: $0 \le argument \le 2\pi$

Vertical Shift: $y = D$

To graph "Sine or Cosine"

1- Find the Amplitude
2- Find the Period
3- Construct a table

x	$y = A\cos(Bx+C)+D$	$y = A\sin(Bx+C)+D$
φ	$D+A$	D
$\varphi + \frac{P}{4}$	D	$D+A$
$\varphi + \frac{P}{2}$	$D-A$	D
$\varphi + \frac{3P}{4}$	D	$D-A$
$\varphi + P$	$D+A$	D

4- Graph *One Cycle*
5- Extend the graph, if necessary

The graphs of $y = A\tan(Bx+C)+D$ and $y = A\cot(Bx+C)+D$, where $B > 0$, will have the following characteristics:

No Amplitude Period $= \dfrac{\pi}{|B|}$ Phase Shift $= -\dfrac{C}{B}$ One cycle: $0 \le argument \le \pi$

Vertical Shift: $y = D$

x	$y = A\tan(Bx+C)+D$	$y = A\cot(Bx+C)+D$
φ	D	∞
$\varphi + \frac{P}{4}$	$D+A$	$D+A$
$\varphi + \frac{P}{2}$	∞	D
$\varphi + \frac{3P}{4}$	$D-A$	$D-A$
$\varphi + P$	D	∞