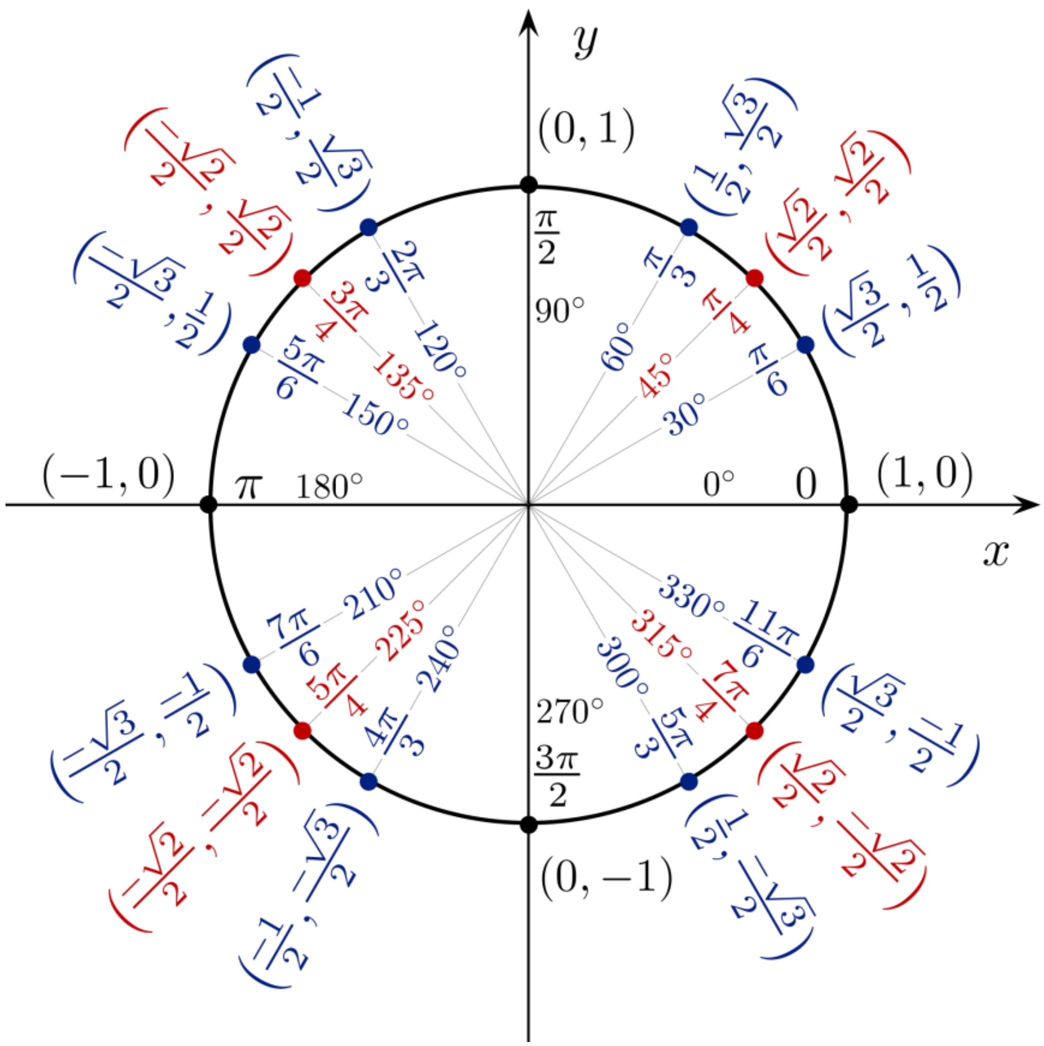
2π (radians) $\equiv 360° \equiv 1$ revolution $\qquad \theta = \frac{s}{r}$ (radians) $\qquad v = \frac{s}{t} = r\omega = r\frac{\theta}{t} \qquad \omega = \frac{\theta}{t} = \frac{v}{r} = \frac{s}{rt} = \frac{v\theta}{s}$

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

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



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

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

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

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

Half-Angle:

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

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:

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

Law of Sines:

$$\frac{a}{\sin A}=\frac{b}{\sin B}=\frac{c}{\sin C} \qquad \frac{\sin A}{a}=\frac{\sin B}{b}=\frac{\sin C}{c}$$

Law of Cosines:

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

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

Vectors:

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

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

$$\left(r_1 cis\theta_1\right)\left(r_2 cis\theta_2\right)=r_1 r_2 cis\left(\theta_1+\theta_2\right)$$

$$\frac{r_1 cis\theta_1}{r_2 cis\theta_2}=\frac{r_1}{r_2}cis\left(\theta_1-\theta_2\right)$$

De Moivre's *Theorem*:

$$\left[rcis\theta\right]^n=r^n\left(cisn\theta\right)$$

$$\left[rcis\theta\right]^{1/n}=\sqrt[n]{r}cis\alpha \qquad \alpha=\frac{\theta}{n}+\frac{360°k}{n}$$

To graph "Sine or *Cosine"*

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 $= \phi = -\dfrac{C}{B}$ One cycle: $0 \le argument \le 2\pi$

Vertical Shift: $y = D$

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

x	$y = A\cos(Bx + C) + D$	$y = A\sin(Bx + C) + D$
$0 + \varphi$	$D + A$	D
$\frac{P}{4} + \varphi$	D	$D + A$
$\frac{P}{2} + \varphi$	$D - A$	D
$\frac{3P}{4} + \varphi$	D	$D - A$
$P + \varphi$	$D + A$	D

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

To graph "Tangent or *Cotangent"*

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	$y = A\tan(Bx + C) + D$	$y = A\cot(Bx + C) + D$
$0 + \varphi$	D	∞
$\frac{P}{4} + \varphi$	$D + A$	$D + A$
$\frac{P}{2} + \varphi$	∞	D
$\frac{3P}{4} + \varphi$	$D - A$	$D - A$
$P + \varphi$	D	∞