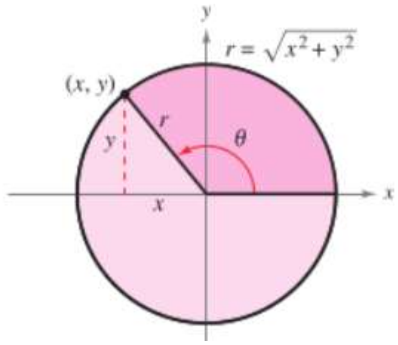
Trigonometry Review

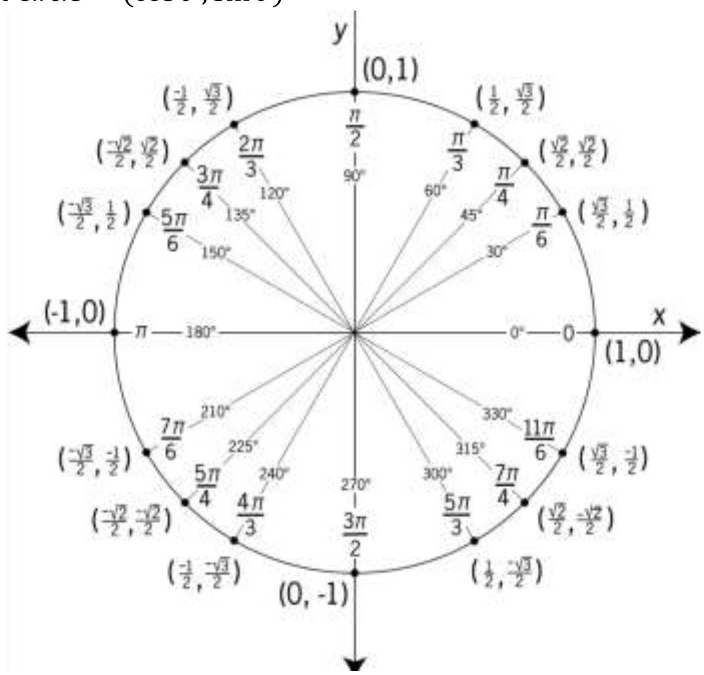
Circular Function Definitions



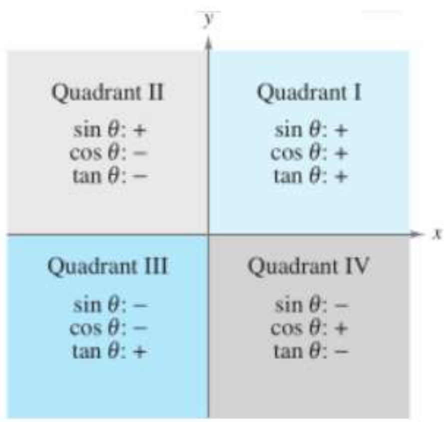
$\sin\theta = \frac{y}{r}$ $\cos\theta = \frac{x}{r}$ $\tan\theta = \frac{y}{x}, x \neq 0$

$\csc\theta = \frac{r}{y}, y \neq 0$ $\sec\theta = \frac{r}{x}, x \neq 0$ $\cot\theta = \frac{x}{y}, y \neq 0$

Unit Circle $(\cos\theta, \sin\theta)$



Signs of the Trig Ratios in each Quadrant



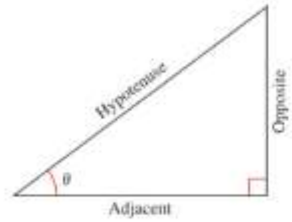
Trigonometry Ratio Table

Angles (In Degrees) x	0°	30°	45°	60°	90°	180°	270°	360°
Angles (In Radians) x	0	$\frac{\pi}{6}$	$\frac{\pi}{4}$	$\frac{\pi}{3}$	$\frac{\pi}{2}$	π	$\frac{3\pi}{2}$	2π
sin x	0	$\frac{1}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{\sqrt{3}}{2}$	1	0	-1	0
cos x	1	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	0	-1	0	1
tan x	0	$\frac{1}{\sqrt{3}}$	1	$\sqrt{3}$	Not Defined	0	Not Defined	1
cot x	Not Defined	$\sqrt{3}$	1	$\frac{1}{\sqrt{3}}$	0	Not Defined	0	Not Defined
csc x	Not Defined	2	$\sqrt{2}$	$\frac{2}{\sqrt{3}}$	1	Not Defined	-1	Not Defined
sec x	1	$\frac{2}{\sqrt{3}}$	$\sqrt{2}$	2	Not Defined	-1	Not Defined	1

Right Triangle Definitions of the Trigonometric Functions

$$\sin\theta = \frac{\text{opposite}}{\text{hypotenuse}} \qquad \cos\theta = \frac{\text{adjacent}}{\text{hypotenuse}} \qquad \tan\theta = \frac{\text{opposite}}{\text{adjacent}}$$

$$\csc\theta = \frac{\text{hypotenuse}}{\text{opposite}} \qquad \sec\theta = \frac{\text{hypotenuse}}{\text{adjacent}} \qquad \cot\theta = \frac{\text{adjacent}}{\text{opposite}}$$



Trigonometric Identities

Sum and Difference Formulas	***Power-Reducing Formulas***	***Double-Angle Formulas***
$\sin(\theta \pm \phi) = \sin\theta\cos\phi \pm \cos\theta\sin\phi$	$\sin^2\theta = \frac{1-\cos 2\theta}{2}$	$\sin 2\theta = 2\sin\theta\cos\theta$
$\cos(\theta \pm \phi) = \cos\theta\cos\phi \mp \sin\theta\sin\phi$	$\cos^2\theta = \frac{1+\cos 2\theta}{2}$	$\cos 2\theta = 2\cos^2\theta - 1$ $= 1 - 2\sin^2\theta$ $= \cos^2\theta - \sin^2\theta$
$\tan(\theta \pm \phi) = \frac{\tan\theta \pm \tan\phi}{1 \mp \tan\theta\tan\phi}$	$\tan^2\theta = \frac{1-\cos 2\theta}{1+\cos 2\theta}$	$\tan 2\theta = \frac{2\tan\theta}{1-\tan^2\theta}$

Pythagorean Identities	***Even/Odd Identities***	
$\sin^2\theta + \cos^2\theta = 1$	$\sin(-\theta) = -\sin\theta$	$\csc(-\theta) = -\csc\theta$
$1 + \tan^2\theta = \sec^2\theta$	$\cos(-\theta) = \cos\theta$	$\sec(-\theta) = \sec\theta$
$1 + \cot^2\theta = \csc^2\theta$	$\tan(-\theta) = -\tan\theta$	$\cot(-\theta) = -\cot\theta$

Reciprocal Identities	***Cofunction Identities***	
$\csc\theta = \frac{1}{\sin\theta}$	$\sin\left(\frac{\pi}{2} - u\right) = \cos u$	$\cos\left(\frac{\pi}{2} - u\right) = \sin u$
$\sec\theta = \frac{1}{\cos\theta}$	$\tan\left(\frac{\pi}{2} - u\right) = \cot u$	$\cot\left(\frac{\pi}{2} - u\right) = \tan u$
$\cot\theta = \frac{1}{\tan\theta}$	$\sec\left(\frac{\pi}{2} - u\right) = \csc u$	$\csc\left(\frac{\pi}{2} - u\right) = \sec u$