



**TRIGONOMETRY**

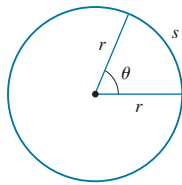
**ANGLE MEASUREMENT**

$\pi$  radians =  $180^\circ$

$1^\circ = \frac{\pi}{180}$  rad      $1 \text{ rad} = \frac{180^\circ}{\pi}$

$s = r\theta$

( $\theta$  in radians)



**RIGHT ANGLE TRIGONOMETRY**

$\sin \theta = \frac{\text{opp}}{\text{hyp}}$

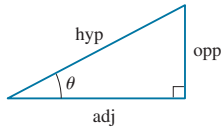
$\csc \theta = \frac{\text{hyp}}{\text{opp}}$

$\cos \theta = \frac{\text{adj}}{\text{hyp}}$

$\sec \theta = \frac{\text{hyp}}{\text{adj}}$

$\tan \theta = \frac{\text{opp}}{\text{adj}}$

$\cot \theta = \frac{\text{adj}}{\text{opp}}$



**TRIGONOMETRIC FUNCTIONS**

$\sin \theta = \frac{y}{r}$

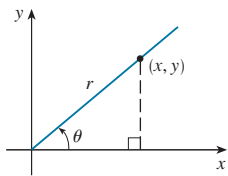
$\csc \theta = \frac{r}{y}$

$\cos \theta = \frac{x}{r}$

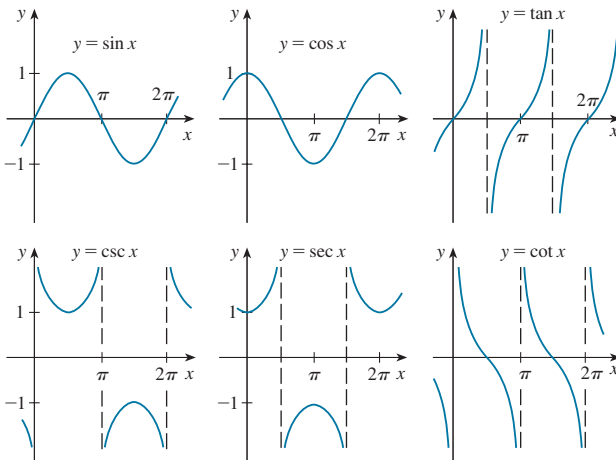
$\sec \theta = \frac{r}{x}$

$\tan \theta = \frac{y}{x}$

$\cot \theta = \frac{x}{y}$



**GRAPHS OF THE TRIGONOMETRIC FUNCTIONS**



**TRIGONOMETRIC FUNCTIONS OF IMPORTANT ANGLES**

$\theta$	radians	$\sin \theta$	$\cos \theta$	$\tan \theta$
$0^\circ$	0	0	1	0
$30^\circ$	$\pi/6$	$1/2$	$\sqrt{3}/2$	$\sqrt{3}/3$
$45^\circ$	$\pi/4$	$\sqrt{2}/2$	$\sqrt{2}/2$	1
$60^\circ$	$\pi/3$	$\sqrt{3}/2$	$1/2$	$\sqrt{3}$
$90^\circ$	$\pi/2$	1	0	—

**FUNDAMENTAL IDENTITIES**

$\csc \theta = \frac{1}{\sin \theta}$

$\sec \theta = \frac{1}{\cos \theta}$

$\tan \theta = \frac{\sin \theta}{\cos \theta}$

$\cot \theta = \frac{\cos \theta}{\sin \theta}$

$\cot \theta = \frac{1}{\tan \theta}$

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

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

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

$\sin(-\theta) = -\sin \theta$

$\cos(-\theta) = \cos \theta$

$\tan(-\theta) = -\tan \theta$

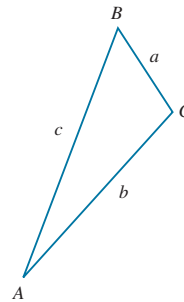
$\sin\left(\frac{\pi}{2} - \theta\right) = \cos \theta$

$\cos\left(\frac{\pi}{2} - \theta\right) = \sin \theta$

$\tan\left(\frac{\pi}{2} - \theta\right) = \cot \theta$

**THE LAW OF SINES**

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



**THE LAW OF COSINES**

$a^2 = b^2 + c^2 - 2bc \cos A$

$b^2 = a^2 + c^2 - 2ac \cos B$

$c^2 = a^2 + b^2 - 2ab \cos C$

**ADDITION AND SUBTRACTION FORMULAS**

$\sin(x + y) = \sin x \cos y + \cos x \sin y$

$\sin(x - y) = \sin x \cos y - \cos x \sin y$

$\cos(x + y) = \cos x \cos y - \sin x \sin y$

$\cos(x - y) = \cos x \cos y + \sin x \sin y$

$\tan(x + y) = \frac{\tan x + \tan y}{1 - \tan x \tan y}$

$\tan(x - y) = \frac{\tan x - \tan y}{1 + \tan x \tan y}$

**DOUBLE-ANGLE FORMULAS**

$\sin 2x = 2 \sin x \cos x$

$\cos 2x = \cos^2 x - \sin^2 x = 2 \cos^2 x - 1 = 1 - 2 \sin^2 x$

$\tan 2x = \frac{2 \tan x}{1 - \tan^2 x}$

**HALF-ANGLE FORMULAS**

$\sin^2 x = \frac{1 - \cos 2x}{2}$       $\cos^2 x = \frac{1 + \cos 2x}{2}$