

# Trigonometric Identities—Handout

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- The Unit Circle.
- Graphs of the Trigonometric Functions.
- Values of sine, cosine, and tangent at  $0, \pi/6, \pi/4, \pi/3, \pi/2$ , etc.

$\theta$	0	$\pi/6$	$\pi/4$	$\pi/3$	$\pi/2$
$\cos \theta$	1	$\sqrt{3}/2$	$1/\sqrt{2}$	$1/2$	0
$\sin \theta$	0	$1/2$	$1/\sqrt{2}$	$\sqrt{3}/2$	1
$\tan \theta$	0	$1/\sqrt{3}$	1	$\sqrt{3}$	undefined

- Definitions.

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

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

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

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

- Pythagorean Identities.

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

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

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

- Symmetry.

$$\begin{aligned}-\sin \theta &= \sin(-\theta) \\ \cos \theta &= \cos(-\theta)\end{aligned}$$

- Addition formulas.

$$\begin{aligned}\cos(\alpha \pm \beta) &= \cos \alpha \cos \beta \mp \sin \alpha \sin \beta \\ \sin(\alpha \pm \beta) &= \sin \alpha \cos \beta \pm \cos \alpha \sin \beta\end{aligned}$$

- Double and half angle formulas.

$$\begin{aligned}\sin 2\theta &= 2 \sin \theta \cos \theta \\ \cos 2\theta &= \cos^2 \theta - \sin^2 \theta = 2 \cos^2 \theta - 1 \\ \cos^2 \theta &= \frac{1}{2}(1 + \cos 2\theta) \\ \sin^2 \theta &= \frac{1}{2}(1 - \cos 2\theta)\end{aligned}$$