

Trigonometric Definitions

$$\sin(\theta) = y\text{-coordinate}$$

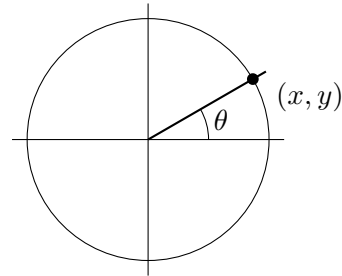
$$\cos(\theta) = x\text{-coordinate}$$

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

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

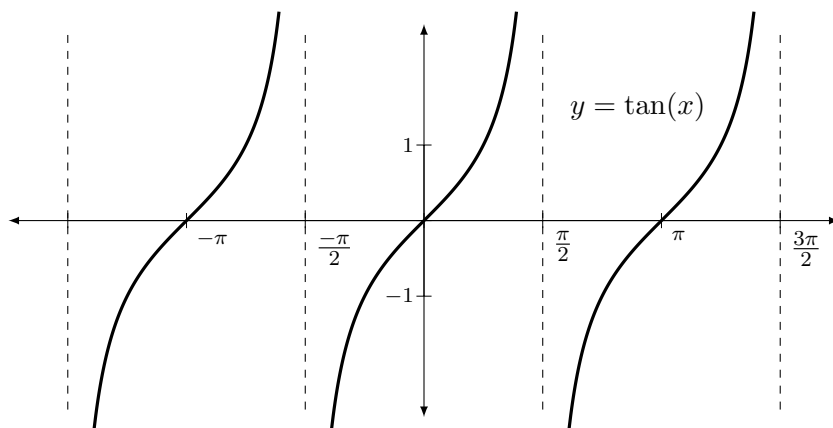
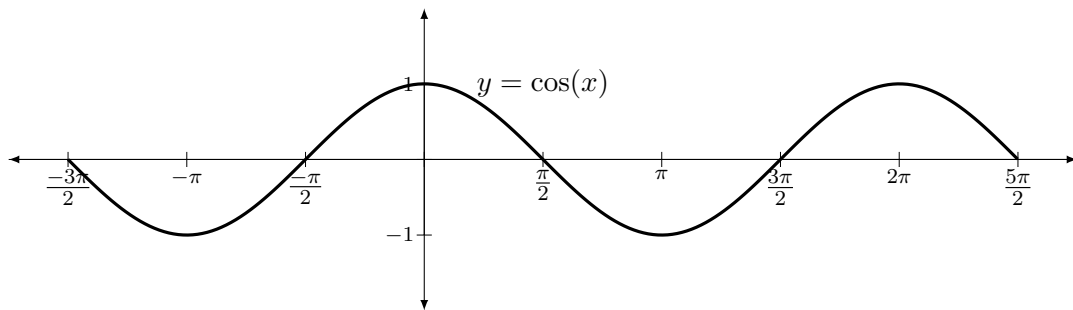
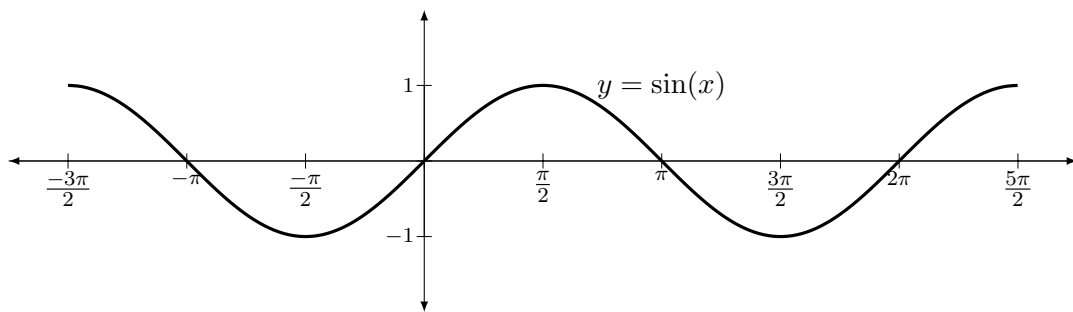
$$\sec(\theta) = \frac{1}{\cos(\theta)}$$

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



For the rest of the handout, we represent the angle with the variable x instead of the variable θ .

Graphs of Trigonometric Functions



Trigonometric Identities

Pythagorean

$$\sin^2(x) + \cos^2(x) = 1$$

$$\tan^2(x) + 1 = \sec^2(x)$$

$$1 + \cot^2(x) = \csc^2(x)$$

Double Angle

$$\sin(2u) = 2 \sin(u) \cos(u)$$

$$\cos(2u) = \cos^2(u) - \sin^2(u)$$

$$\cos(2u) = 2 \cos^2(u) - 1$$

$$\cos(2u) = 1 - 2 \sin^2(u)$$

Power Reduction

$$\cos^2(u) = \frac{1 + \cos(2u)}{2}$$

$$\sin^2(u) = \frac{1 - \cos(2u)}{2}$$

Sum and Difference of Angles

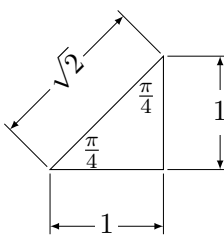
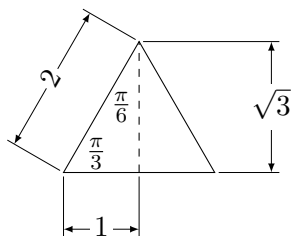
$$\sin(u \pm v) = \sin(u) \cos(v) \pm \cos(u) \sin(v)$$

$$\cos(u \pm v) = \cos(u) \cos(v) \mp \sin(u) \sin(v)$$

Special Angles

x	0	$\frac{\pi}{6}$	$\frac{\pi}{4}$	$\frac{\pi}{3}$	$\frac{\pi}{2}$
$\sin(x)$	0	$\frac{1}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{3}}{2}$	1
$\cos(x)$	1	$\frac{\sqrt{3}}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{1}{2}$	0
$\tan(x)$	0	$\frac{1}{\sqrt{3}}$	1	$\sqrt{3}$	DNE

This table can be derived using Triangle Trigonometry, and the following two triangles.



Rescaling these triangles, we obtain triangles on the unit circle for the three basic angles:

