

### Sin

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

$$\sin\left(\frac{\pi}{2} + x\right) = \cos x$$

$$\sin(\pi - x) = \sin x$$

$$\sin(\pi + x) = -\sin x$$

$$\sin\left(\frac{3\pi}{2} - x\right) = -\cos x$$

$$\sin\left(\frac{3\pi}{2} + x\right) = -\cos x$$

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

### tan

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

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

$$\tan(\pi - x) = -\tan x$$

$$\tan(\pi + x) = \tan x$$

$$\tan\left(\frac{3\pi}{2} - x\right) = \cot x$$

$$\tan\left(\frac{3\pi}{2} + x\right) = -\cot x$$

$$\tan(-x) = -\tan x$$

### Cos

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

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

$$\cos(\pi - x) = -\cos x$$

$$\cos(\pi + x) = -\cos x$$

$$\cos\left(\frac{3\pi}{2} - x\right) = \sin x$$

$$\cos\left(\frac{3\pi}{2} + x\right) = -\sin x$$

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

### Cot

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

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

$$\cot(\pi - x) = -\cot x$$

$$\cot(\pi + x) = \cot x$$

$$\cot\left(\frac{3\pi}{2} - x\right) = \tan x$$

$$\cot\left(\frac{3\pi}{2} + x\right) = -\tan x$$

$$\cot(-x) = -\cot x$$

More useful identities:

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

$$\cos(x \pm y) = \cos x \cos y \mp \sin x \sin y$$

$$\tan(x \pm y) = \frac{\tan x \pm \tan y}{1 \mp \tan x \tan y}$$

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

$$\cos(2x) = \cos^2 x - \sin^2 x = 2 \cos^2 x - 1 = 1 - 2 \sin^2 x \longrightarrow$$

$$\left\{ \begin{array}{l} \cos^2 x = \frac{1 + \cos(2x)}{2} \\ \sin^2 x = \frac{1 - \cos(2x)}{2} \end{array} \right.$$

Domains and Ranges of inverse trig functions:

$$y = \sin^{-1} x; \quad -1 \leq x \leq 1 \quad \& \quad -\frac{\pi}{2} \leq y \leq \frac{\pi}{2}$$

$$y = \cos^{-1} x = \frac{\pi}{2} - \sin^{-1} x; \quad -1 \leq x \leq 1 \quad \& \quad 0 \leq y \leq \pi$$

$$y = \tan^{-1} x; \quad -\infty < x < \infty \quad \& \quad -\frac{\pi}{2} < y < \frac{\pi}{2}$$

$$y = \cot^{-1} x = \tan^{-1}\left(\frac{1}{x}\right); \quad x \neq 0 \quad \& \quad 0 < y < \pi$$

$$y = \sec^{-1} x = \cos^{-1}\left(\frac{1}{x}\right); \quad x \geq 1 \text{ or } x \leq -1 \quad \& \quad 0 \leq y < \frac{\pi}{2} \text{ or } \frac{\pi}{2} < y \leq \pi$$

$$y = \csc^{-1} x = \sin^{-1}\left(\frac{1}{x}\right); \quad x \geq 1 \text{ or } x \leq -1 \quad \& \quad 0 < y \leq \frac{\pi}{2} \text{ or } -\frac{\pi}{2} \leq y < 0$$