

# Trigonometric Functions

## Derivatives

$$\frac{d}{dx}[\sin x] = \cos x$$

$$\frac{d}{dx}[\cos x] = -\sin x$$

$$\frac{d}{dx}[\tan x] = \sec^2 x$$

$$\frac{d}{dx}[\csc x] = \csc x \cot x$$

$$\frac{d}{dx}[\sec x] = \sec x \tan x$$

$$\frac{d}{dx}[\cot x] = -\csc^2 x$$

## Anti-derivatives

$$\int \sin x \, dx = -\cos x + C$$

$$\int \cos x \, dx = \sin x + C$$

$$\int \sec^2 x \, dx = \tan x + C$$

$$\int \sec x \tan x \, dx = \sec x + C$$

$$\int \tan x \, dx = \ln|\sec x| + C$$

$$\int \sec x \, dx = \ln|\sec x + \tan x| + C$$

$$\int \csc^2 x \, dx = -\cot x + C$$

$$\int \csc x \cot x \, dx = -\csc x + C$$

$$\int \cot x \, dx = \ln|\csc x| + C$$

$$\int \csc x \, dx = \ln|\csc x - \cot x| + C$$

## Pythagorean Identities

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

$$(\text{all} \times \cos^{-2} \theta) \Rightarrow \tan^2 \theta + 1 = \sec^2 \theta$$

$$(\text{all} \times \sin^{-2} \theta) \Rightarrow 1 + \cot^2 \theta = \csc^2 \theta$$

## Double and Half-Angle Formulas

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

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

$$\cos^2 \theta = \frac{1 + \cos 2\theta}{2}$$

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

## Sum and Difference Formulas

$$\cos(a+b) = \cos a \cos b - \sin a \sin b$$

$$\cos(a-b) = \cos a \cos b + \sin a \sin b$$

$$\sin(a+b) = \sin a \cos b + \cos a \sin b$$

$$\sin(a-b) = \sin a \cos b - \cos a \sin b$$