

## Calc Trig

### Derivative of trig:

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

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

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

$$\frac{d}{dx} \csc x = -\csc x \cot x$$

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

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

### Derivative of hyperbolic trig:

$$\frac{d}{dx} \sinh x = \cosh x$$

$$\frac{d}{dx} \cosh x = \sinh x$$

$$\frac{d}{dx} \tanh x = \operatorname{sech}^2 x$$

$$\frac{d}{dx} \operatorname{csch} x = -\operatorname{csch} x \coth x$$

$$\frac{d}{dx} \operatorname{sech} x = -\operatorname{sech} x \tanh x$$

$$\frac{d}{dx} \coth x = -\operatorname{csch}^2 x$$

### Derivative of inverse trig:

$$\frac{d}{dx} \sin^{-1} x = \frac{1}{\sqrt{1-x^2}}$$

$$\frac{d}{dx} \cos^{-1} x = -\frac{1}{\sqrt{1-x^2}}$$

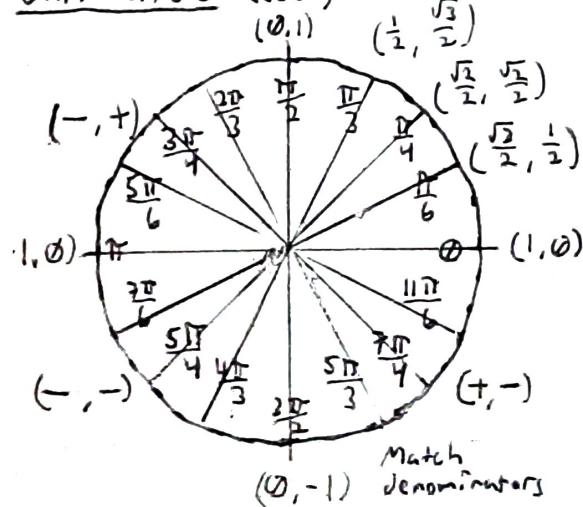
$$\frac{d}{dx} \tan^{-1} x = \frac{1}{1+x^2}$$

$$\frac{d}{dx} \csc^{-1} x = -\frac{1}{x\sqrt{x^2-1}}$$

$$\frac{d}{dx} \sec^{-1} x = \frac{1}{x\sqrt{x^2-1}}$$

$$\frac{d}{dx} \cot^{-1} x = -\frac{1}{1+x^2}$$

### Unit circle: $(\cos, \sin)$



### Hyperbolic trig:

$$\sinh x = \frac{e^x - e^{-x}}{2}$$

$$\cosh x = \frac{e^x + e^{-x}}{2}$$

$$\tanh x = \frac{e^{2x}-1}{e^{2x}+1}$$

Trig Properties:

Quotient identities:

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

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

Reciprocal identities:

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

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

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

Pythagorean identities:

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

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

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

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

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

Double angle formulas:

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

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

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

$$\frac{d}{dx} \sin^{-1} \frac{x}{a} = \frac{1}{\sqrt{a^2 - x^2}}$$

$$\frac{d}{dx} \csc^{-1} \frac{x}{a} = - \frac{1}{|x| \sqrt{x^2 - a^2}}$$

$$\frac{d}{dx} \cos^{-1} \frac{x}{a} = - \frac{1}{\sqrt{a^2 - x^2}}$$

$$\frac{d}{dx} \sec^{-1} \frac{x}{a} = \frac{1}{|x| \sqrt{x^2 - a^2}}$$

$$\frac{d}{dx} \tan^{-1} \frac{x}{a} = \frac{a}{a^2 + x^2}$$

$$\frac{d}{dx} \cot^{-1} \frac{x}{a} = - \frac{a}{a^2 + x^2}$$