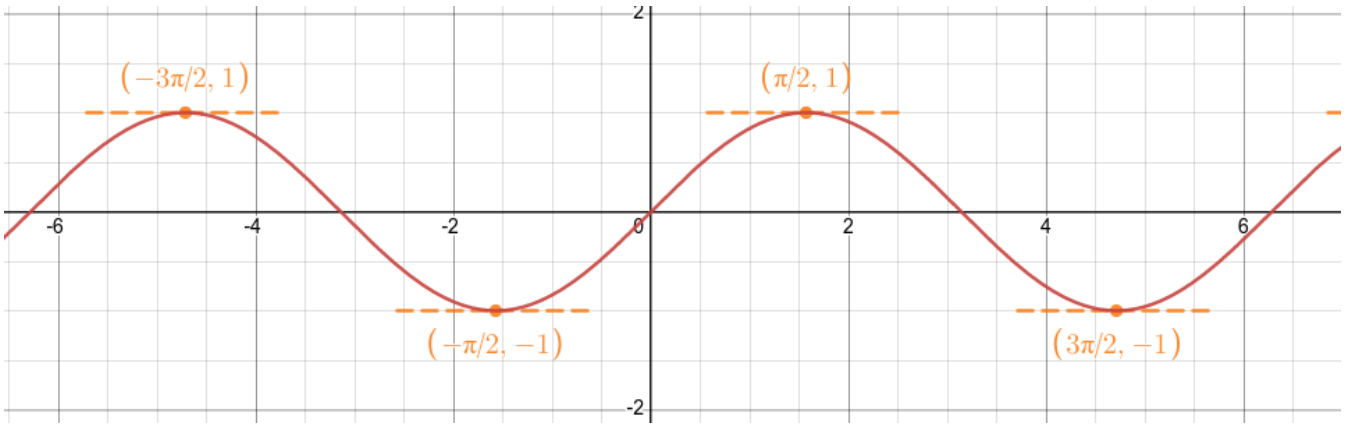
Chapter 2
Derivatives
2.4 Derivatives of Trigonometric Functions

Derivative of the Sine function.



Desmos: https://www.desmos.com/calculator/mhbl7c2hzy

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

Proof.

Trigonometric Functions (reminder).

- $\sec x = \dfrac{1}{\cos x}$
- $\tan x = \dfrac{\sin x}{\cos x}$
- $\csc x = \dfrac{1}{\sin x}$
- $\cot x = \dfrac{1}{\tan x} = \dfrac{\cos x}{\sin x}$

Derivatives of Other Trigonometric Functions.

Derivatives of Trigonometric Functions

$$\frac{d}{dx}(\sin x) = \cos x \qquad \frac{d}{dx}(\csc x) = -\csc x \cot x$$

$$\frac{d}{dx}(\cos x) = -\sin x \qquad \frac{d}{dx}(\sec x) = \sec x \tan x$$

$$\frac{d}{dx}(\tan x) = \sec^2 x \qquad \frac{d}{dx}(\cot x) = -\csc^2 x$$

Proof for the formula for f(x) = tan(x).

EXAMPLE 2 Differentiate $f(x) = \dfrac{\sec x}{1 + \tan x}$. For what values of x does the graph of f have a horizontal tangent?

EXAMPLE 6 Calculate $\lim_{x \to 0} x \cot x$.