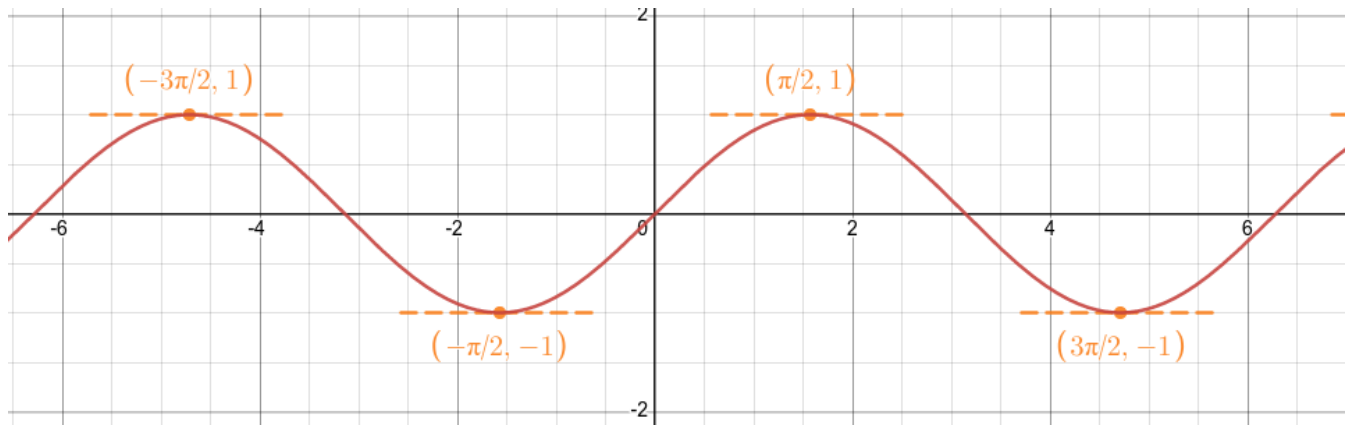


Chapter 2

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).

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

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

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

$$\bullet \cot x = \frac{1}{\tan x} = \frac{\cos x}{\sin x}$$

Derivatives of Other Trigonometric Functions.

Derivatives of Trigonometric Functions

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

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

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

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

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

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

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

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

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