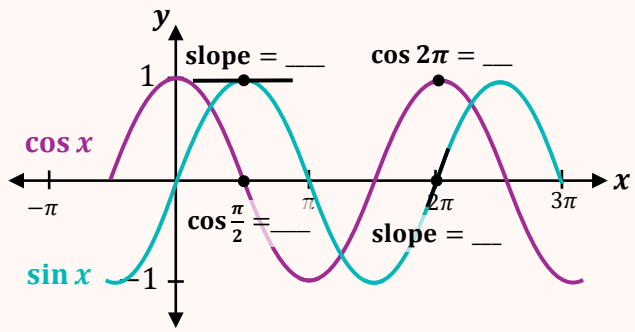
TOPIC: DERIVATIVES OF TRIG FUNCTIONS

Derivatives of Sine & Cosine

◆ Instead of using limits, use these rules to quickly find derivatives of functions with **sin** & **cos**.

New **Derivatives of Sine & Cosine**



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

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

EXAMPLE Find the derivative.

(A)

$$f(x) = 3x + \cos x$$

(B)

$$f(x) = x^2 \sin x$$

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PRACTICE Find the derivative of the function.

(***A***)

$$h(t) = \sin t \ \cos t$$

(***B***)

$$f(x) = \frac{5\cos x}{2x^3}$$

(***C***)

$$y = \frac{\sin\theta}{2 + \cos\theta}$$

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Derivatives of Other Trig Functions

◆ Derivatives of other trig functions can be found by rewriting in terms of $\sin$ & $\cos$, then using the quotient rule.

New **Derivative of Tangent**

$$\frac{d}{dx}\left(\frac{\sin x}{\cos x}\right) = \frac{\cos x\,(\qquad) - \sin x\,(\qquad)}{\cos^2 x}$$

$$= \frac{\qquad\qquad\qquad\qquad}{\cos^2 x}$$

$$= \frac{\qquad\qquad}{\cos^2 x}$$

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

EXAMPLE Find the derivative.

Recall

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

New

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

$$\frac{d}{dx}\sec x = \tan x \sec x \qquad \frac{d}{dx}\csc x = \qquad \cot x \csc x$$

(***A***)

$$f(x) = 3x^2 + \cot x$$

(***B***)

$$f(x) = 4x \sec x$$

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PRACTICE Find the derivative of the function.

(***A***)

$r = \csc x - 3\sin x + \tan x$

(***B***)

$f(x) = 4x^2 \sec x - \sqrt{x}$

(***C***)

$y = \dfrac{\cot\theta}{3 + \sec\theta}$

TOPIC: DERIVATIVES OF TRIG FUNCTIONS

EXAMPLE Find the slope of the tangent line of $f(x)$ at $x = \frac{\pi}{4}$.

$f(x) = \sec x$

TOPIC: DERIVATIVES OF TRIG FUNCTIONS

EXAMPLE Find the derivative of each function.

(***A***)

$f(x) = \sin^5 x$

(***B***)

$f(x) = \sin(x^5)$

PRACTICE Find the derivative of the function.

(***A***)

$f(x) = \sin(3x^2)$

(***B***)

$y = 3\cos^4\theta$

(***C***)

$f(t) = \sec(4t + 5)$