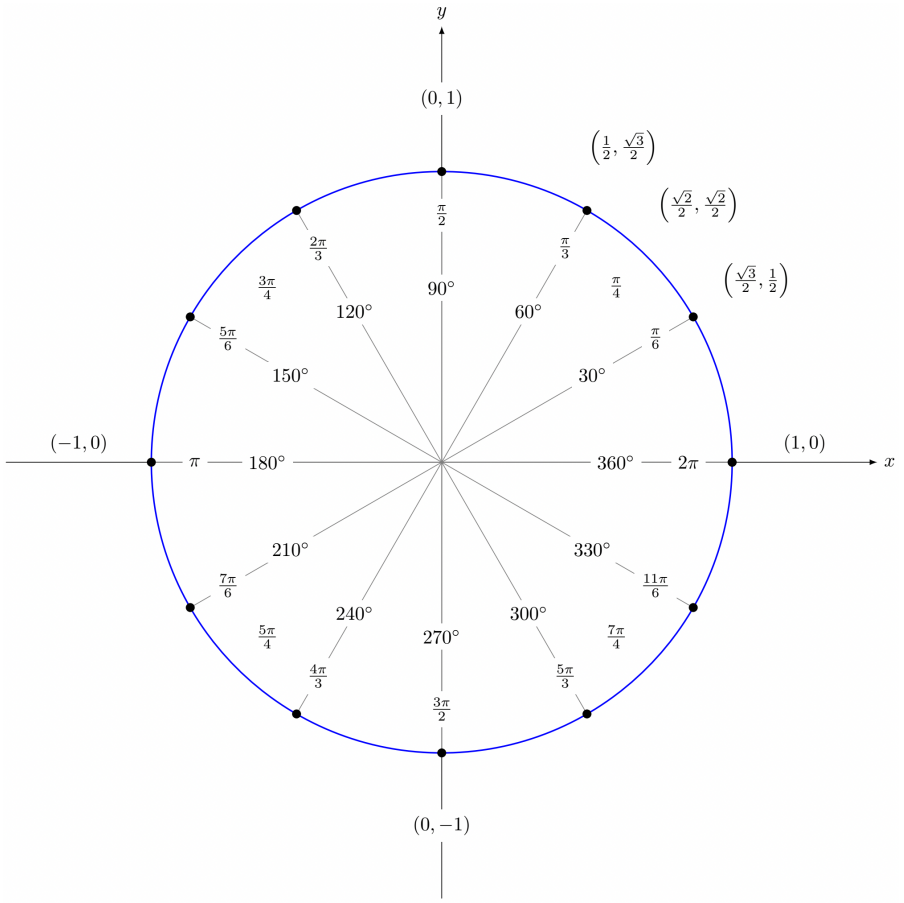
How can we find the derivatives of trigonometric functions using the Quotient Rule?

Quick Check

Determine the point(s) at which the graph of the function, $f(x)$, has a horizontal tangent line.

$$f(x) = x - \sin x + 2$$



Recall the Derivatives of Sine and Cosine Functions

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

Visual Explanation 🌐 Geogebra Animation

✍️ AND some helpful pythagorean identities.

$$\sin^2 x + \cos^2 x = 1 \qquad 1 + \cot^2 x = \csc^2 x \qquad \tan^2 x + 1 = \sec^2 x$$

Basic Trigonometric Derivatives

Recall 🧐

$$\tan x = \frac{\sin x}{\cos x} \qquad \cot x = \frac{\cos x}{\sin x} \qquad \sec x = \frac{1}{\cos x} \qquad \csc x = \frac{1}{\sin x}$$

Find each of the following derivatives using the Quotient Rule.

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

Find the derivative.

Examples [1-3]:

1. $y = 2 + x - \sin x$

2. $f(x) = x^2 \cdot \tan x$

3. $y = \dfrac{x}{1 + \cos x}$

4. Find the equation of the tangent line to $y = x \sin x$ at $x = \dfrac{\pi}{2}$.

5. $y = \dfrac{\sin x}{1 - \cos x}$

6. Find the 27^{th} derivative of $y = \cos x$.

7. Find the equation of the normal line to $y = \sin x + \cos x$ at $x = \pi$.