

What you'll Learn About

- How to find the derivative of a trig function

A) $y = 5 + x^2 - \tan x$

$$y' = 2x - \sec^2 x$$

B) $y = x \sin x = (x)(\sin x)$

$$y' = x(\cos x) + \sin(x)(1)$$

$$4 \div \frac{1}{\tan \theta} = 4 \cdot \tan \theta$$

C) $y = \frac{4}{\cot \theta}$

$$\begin{aligned} \frac{dy}{d\theta} &= y' = \frac{\cot \theta(0) - 4(-\csc^2 \theta)}{(\cot \theta)^2} \\ &= \frac{4 \csc^2 \theta}{\cot^2 \theta} \end{aligned}$$

C) $y = \frac{4}{\cot \theta} = \frac{4}{\frac{1}{\tan \theta}} = (4 \tan \theta)$

$$y' = 4 \sec^2 \theta$$

$$4 \sec^2 \theta + \cancel{\tan \theta}$$

D) $y = \frac{\sin \theta - \cos \theta}{\sec \theta + \csc \theta}$

$$\frac{dy}{d\theta} = \frac{(\sec \theta + \csc \theta)(\cos \theta + \sin \theta) - (\sin \theta - \cos \theta)(\sec \theta \tan \theta - \csc \theta \cot \theta)}{(\sec \theta + \csc \theta)^2}$$

$$\sec \theta \cos \theta + \sec \theta \sin \theta + \csc \theta \cos \theta + \csc \theta \sin \theta - \sin \theta \sec \theta \tan \theta + \sin \theta \csc \theta \cot \theta + \cos \theta \sec \theta \tan \theta - \cos \theta \csc \theta \cot \theta$$

$$1 + \frac{\sin \theta}{\cos \theta} + \frac{\cos \theta}{\sin \theta} + 1 - \sin \left(\frac{1}{\cos \theta} \frac{\sin \theta}{\cos \theta} \right) + \frac{\cos \theta}{\sin \theta} + \frac{\sin \theta}{\cos \theta} - \cos \left(\frac{1}{\sin \theta} \frac{\cos \theta}{\sin \theta} \right)$$

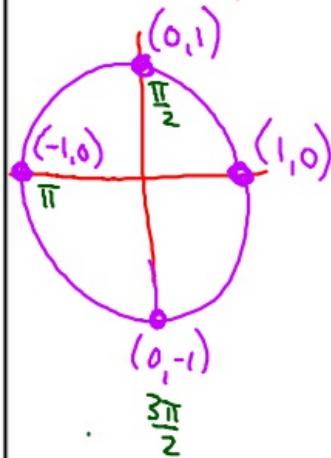
$$2 + \frac{2 \sin \theta}{\cos \theta} + \frac{2 \cos \theta}{\sin \theta} + \frac{\sin^2 \theta}{\cos^2 \theta} - \frac{\cos^2 \theta}{\sin^2 \theta}$$

$$\frac{2 \sin^2 \theta \cos^2 \theta}{\sin^2 \theta \cos^2 \theta} +$$

$$y = y_1 + m(x - x_1)$$

pt \downarrow slope $(\frac{dy}{dx})$

y	x	tanx
sinx	cosx	
$\frac{\sqrt{3}}{2}$	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{3}}$
$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{2}}{2}$	1
$\frac{\sqrt{3}}{2}$	$\frac{1}{2}$	$\sqrt{3}$



Find equations for the lines that are tangent and normal to the graph of $y = 2\cos x$ at $x = \frac{\pi}{4}$

$$y = 2\cos x \quad \left(\frac{\pi}{4}, \frac{\sqrt{2}}{2}\right)$$

$$\frac{dy}{dx} = 2(-\sin x)$$

$$\left.\frac{dy}{dx}\right|_{x=\frac{\pi}{4}} = -2\sin\left(\frac{\pi}{4}\right) = -2\left(\frac{\sqrt{2}}{2}\right) = -\sqrt{2}$$

$$\text{Normal: } y = \sqrt{2} + \frac{1}{\sqrt{2}}\left(x - \frac{\pi}{4}\right)$$

Find the points on the curve $y = \cot x$, $0 \leq x \leq \frac{\pi}{2}$, where the tangent line is parallel to the line $y = -2x$.

$$y = \cot x$$

$$\text{tangent line slope } \frac{dy}{dx}$$

$$-2 = \frac{dy}{dx}$$

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

$$-\csc^2 x = -2$$

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

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

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

$$\sin x = \frac{\sqrt{2}}{2}$$

$$\pm \frac{1}{\sqrt{2}} = \sin(x) \quad \text{angle}$$

$$x = \frac{\pi}{4}$$