What you'll Learn About

- How to find the derivative of a composite function

$y = \sin(\theta)$

$\frac{dy}{d\theta} = \cos\theta \cdot \frac{d\theta}{d\theta}$

A) $y = \sin(x)$

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

$\frac{dy}{dx} = \cos(x) \cdot 1$

$\frac{dy}{dx} = \cos(x) \cdot \frac{dx}{dx}$

B) $y = \sin(x^2 - 4)$

$\frac{dy}{dx} = \cos(x^2-4) \cdot (2x)$

① derivative of trig fct
- don't chang angle

② Mult by deriv of angle

$y = (x)^2$

$\frac{dy}{dx} = 2(x)^1 \cdot 1$

C) $y = \cos^2(3x)$

$y = [\cos(3x)]^2$

$\frac{dy}{dx} = 2[\cos(3x)]^1 \cdot (-\sin(3x)) \cdot 3$

$= -6\cos(3x)\sin(3x)$

① Power Rule

② Derivative of base

a) deriv of trig fct

b) deriv of angle

D) $y = (\csc x)^2 \cot x$

① Product Rule

$\frac{dy}{dx} = (\csc x)^2 \cdot (-\csc^2 x) \cdot 1 + \cot x \cdot [2(\csc x)^1 \cdot (-\csc x \cot x)]$

$\frac{d}{dx}\cot x$ $\frac{d}{dx}(\text{angle})$ $\frac{d}{dx}((\csc x)^2)$ Power rule deriv of base

$\frac{dy}{dx} = -\csc^4 x - 2\cot^2 x \csc^2 x$

① Power Rule
② Deriv of base

E) $y = 5\sqrt{\sin(2x) + \cos(2x)}$

$$y = 5\left(\sin(2x) + \cos(2x)\right)^{1/2}$$

$$\frac{dy}{dx} = \frac{5}{2}\left(\sin(2x) + \cos(2x)\right)^{-1/2} \cdot \left(\cos(2x) \cdot 2 + (-\sin(2x)) \cdot 2\right)$$

E) $y = (\sin x + \cos x)^{-2}$

$$\frac{dy}{dx} = -2\left(\sin x + \cos x\right)^{-3} \cdot \left(\cos x \cdot 1 + (-\sin x) \cdot 1\right)$$

F) $y = \dfrac{1}{\left(\sin(x^3) + \cos(x^3)\right)^4}$

$$y = \left(\sin(x^3) + \cos(x^3)\right)^{-4}$$

$$\frac{dy}{dx} = -4\left(\sin(x^3) + \cos(x^3)\right)^{-5} \cdot \left(\cos(x^3) \cdot 3x^2 + \left(-\sin(x^3) \cdot 3x^2\right)\right)$$