

Section 3.5: Implicit Differentiation

Example: Examine the derivative of $x^2 + y^2 = 16$

Example: Compute $\frac{dy}{dx}$. $x^3 + 2y^3 = 4xy$

Example: Compute $\frac{dy}{dx}$. $\tan(x^3) - 4xy^2 + e^{x^2} = \cos(3y)$

Example: Compute $\frac{dy}{dx}$ and $\frac{dy}{dx}\Big|_{(-1,1)}$.

$$x = \frac{3 - y^2}{x - y}$$

Example: Compute $\frac{dy}{dx}$. $y = \sin^{-1}(x)$

Derivatives of Inverse Trigonometric Functions

$$\frac{d}{dx} \sin^{-1}(x) = \frac{1}{\sqrt{1-x^2}}$$

$$\frac{d}{dx} \csc^{-1}(x) = \frac{-1}{x\sqrt{x^2-1}}$$

$$\frac{d}{dx} \cos^{-1}(x) = \frac{-1}{\sqrt{1-x^2}}$$

$$\frac{d}{dx} \sec^{-1}(x) = \frac{1}{x\sqrt{x^2-1}}$$

$$\frac{d}{dx} \tan^{-1}(x) = \frac{1}{1+x^2}$$

$$\frac{d}{dx} \cot^{-1}(x) = \frac{-1}{1+x^2}$$

Example: Find the derivative.

A) $y = (\sin^{-1}(2x))^2$

B) $y = \cos^{-1}(4x^2)$

C) $y = \arctan(\sin(4x))$

D) $y = x^3 \sec^{-1}(5x)$