7.1 Implicit Derivatives I

Wednesday, June 12, 2019 7:14 AM

$4y^3$ DERIVE → $12y^2 \cdot \frac{dy}{dx}$ ← the derivative of y with respect to x

What if $y = 3x^2 - 1$?

$4(3x^2-1)^3$ DERIVE → $12(3x^2-1)^2 \cdot 6x$

D-OUTER · D-INNER

EXPLICIT DIFFERENTATION

$y^2 + x^2 = 4$ (solve for y)

$-x^2 \quad -x^2$

$\sqrt{y^2} = \sqrt{4-x^2}$

$y = \sqrt{4-x^2} \rightarrow y = (4-x^2)^{1/2}$

$\frac{dy}{dx} = \frac{1}{2}(4-x^2)^{-\frac{1}{2}} \cdot (-2x)$

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

IMPLICIT DIFFERENTIATION

$y^2 + x^2 = 4$ ↓ DERIVE

a) $2y\frac{dy}{dx} + 2x = 0$

$-2x \quad -2x$

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

b) $\frac{dy}{dx} = \frac{-x}{y}$

Steps

① Take the derivatives of each term using Power, Product, Quotient, and Chain Rules*

* Every time you take the derivative of a y-variable, you must Multiply the derivative by $\frac{dy}{dx}$

ex

$3x^2 - 4y^2 + 8 = 5x$

a) $6x - 8y\frac{dy}{dx} + 0 = 5$

(Preliminary Equation)

$-6x \quad -6x$

$-8y\frac{dy}{dx} = 5 - 6x$

① derivative by $\frac{dy}{dx}$

② Solve for $\frac{dy}{dx}$

$-6x$

$\frac{-8y\frac{dy}{dx}}{-8y} = \frac{5-6x}{-8y}$

b) $\frac{dy}{dx} = \frac{5-6x}{-8y}$