

Implicit Differentiation

Previously all expressions were set equal to y (Explicit Differentiation).

$$f(x) = 3x^2 + 7x - 5$$

$$f'(x) = 6x + 7$$

$$\frac{dy}{dx} = 6x + 7$$

$$y' = 6x + 7$$

$$f(x) = \frac{3x-1}{5x-1}$$

$$f'(x) = \frac{2}{(5x-1)^2}$$

$$\frac{dy}{dx} = \frac{2}{(5x-1)^2}$$

$$y' = \frac{2}{(5x-1)^2}$$

$$f(x) = \sqrt{(x-1)^3}$$

$$f'(x) = \frac{3\sqrt{x-1}}{2}$$

$$\frac{dy}{dx} = \frac{3\sqrt{x-1}}{2}$$

$$y' = \frac{3\sqrt{x-1}}{2}$$

Not all equations are set equal to y .

$$x^2 + 3y^2 + 7x = 4$$

$$x^2 + 2xy + y^2 + 7x = 3$$

Treat y as some unknown but differentiable function of x .

Examples:

1. Find y' .

a) $x^3 + y^3 + 5y = 7$

b) $x^3 - 3x^2y^4 + 4y^3 = 6x + 1$

c) $2xy + y^2 = x + y$

2. Find the slope of $x^2 + xy + 2y^2 = 28$ at $(2,3)$.

3. Find the slope of $2y^2 + 2xy = 1$ at $x = \frac{1}{2}$.

4. Find the slope of $y^3 + 2x = 7y$ at $y = 1$.