

Do now as a warm-up:

For these, y is a function explicitly defined in terms of x .

$$y = \sqrt{x^2 + 2}$$

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

$$y = x + 1$$

$$y = \sin x$$

For these, y is a function implicitly defined in terms of x .

$$y = \cos xy$$

$$xy = 12$$

$$3x^2y + 2y^2 - 5 = 0$$

$$x + xy + y = 5$$

Be able to explain what makes a function implicitly defined vs. explicitly defined.

2.5 Implicit Differentiation

$$\text{ex. } \frac{d}{dx}[y] =$$

$$\text{ex. } \frac{d}{dx}[2y] =$$

$$\text{ex. } \frac{d}{dx}[y^2] =$$

Implicit Differentiation

Take the derivative of each term with respect to x and solve for dy/dx .

ex. Find dy/dx for $y^2 + 3x = x^2$

ex. Find dy/dx for $\sin x + \cos y = 2y$

ex. Find dy/dx for $y^2 + xy + x^2 = 5$

ex. $3x^4y - 7x^4 - 2y + 4x^3 = -3$

a. Show that $\frac{dy}{dx} = \frac{-12x^3y + 28x^3}{3x^4 - 2 + 12y^2}$

b. Find any point where the tangent line is horizontal.

ex. Find $\frac{d^2y}{dx^2}$ for $1-xy=x-y$

ex. Find where $xy=16$ has a horizontal tangent line.