

**Salahaddin University-Erbil**  
**College of Engineering**  
**Department of Architectural Engineering**  
**First Year Students**  
**2<sup>nd</sup> Semester**



# **Mathematics I**

## **Implicit Differentiation(Ch.2)**

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# Implicit differentiation

1. Differentiate both sides of the equation with respect to  $x$ , treating  $y$  as a differentiable function of  $x$ .
2. Collect the terms with  $dy/dx$  on one side of the equation
3. Solve for  $dy/dx$

# Implicit differentiation

**Example:** Find  $dy/dx$  for

$$y^2 = x$$

$$2y = x^2 + \sin y$$

**Example:** Find  $\frac{d^2y}{dx^2}$  if  $2x^3 - 3y^2 = 7$

**Example** slope of a circle at a point

Find the slope of circle  $x^2 + y^2 = 25$  at point  $(3,-4)$

**Example:** Find  $dy/dx$  if  $y^2 = x^2 + \sin xy$

Example: Find  $dy/dx$

$$(3xy + 7)^2 = 6y$$

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

Class activity

$$x^2y + xy^2 = 6$$

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