IMPLICIT DIFFERENTATION

DIFFERENTIAL CALCULUS

prepared by:

Gyro A. Madrona

Electronics Engineer

TOPIC OUTLINE

Implicit Differentiation

IMPLICIT DIFFERENTIATION

EXPLICIT FUNCTION

The dependent variable (y) is expressed directly in terms of the independent variable (x).

Form

$$y = f(x)$$

example

$$y = 2x + 3$$

$$y = \sin x$$

IMPLICIT FUNCTION

The relationship between the dependent variable (y) and independent variable (x) is not directly solved for one variable in terms of the other. Instead, the relationship is expressed as an equation involving both variables.

Form

$$\boldsymbol{F(x, y) = 0}$$

example

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

$$x^3 + y^3 = 6xy$$

EXERCISE

If $x^2 + y^2 = 25$, find $\frac{dy}{dx}$.

Solution

EXERCISE

Find y' if $x^3 + y^3 = 6xy$

Solution

EXERCISE

Find y' if $\cos x + \sqrt{y} = 5$.

Solution

EXERCISE

If $\cos(xy) = 1 + \sin y$, find $\frac{dy}{dx}$.

Solution

EXERCISE

Use implicit differentiation to find the equation of the tangent line to the curve $x^2 + 2xy - y^2 + x = 2$ @(1,2).

Solution

EXERCISE

Find y' for $y\sin(x^2) = x\sin(y^2)$ by implicit differentiation.

Solution

EXERCISE

Find y' for $\tan(x/y) = x + y$ by implicit differentiation.

Solution

EXERCISE

Use implicit differentiation to find the equation of the tangent line to the curve $y\sin(2x) = x\cos(2y)$ $@(\pi/2, \pi/4)$.

Solution

LABORATORY