



**TRINITY COLLEGE FOR WOMEN  
NAMAKKAL  
Department of Mathematics**

**DIFFERENTIAL EQUATIONS  
21UMA06-ODD Semester**

**Topic: Basis of Differential Equations**

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# Differential Equations

A differential equation is an equation which contains one or more terms and the derivatives of one variable (i.e., dependent variable) with respect to the other variable (i.e., independent variable)

$$dy/dx = f(x)$$

Here

“x” is an independent variable and  
“y” is a dependent variable.

## Order of an Differential Equation

The order of a differential equation is the order of the highest derivative (also known as differential coefficient) present in the equation.

Examples:

$$dy/dx + 1 = 0, \text{ order is } 1.$$

$$(y''')^3 + 3y'' + 6y' - 12 = 0, \text{ order is } 3.$$

# Degree of an Differential Equation

The degree of a differential equation is defined as the power to which the highest order derivative is raised.

For Example

$$dy/dx + 1 = 0, \text{ degree is } 1.$$

$$(y''')^3 + 3y'' + 6y' - 12 = 0, \text{ degree is } 3.$$

# Types of differential Equations

## DIFFERENTIAL EQUATIONS



Ordinary Differential Equations



Partial Differential Equations

# Ordinary Differential Equations

An ordinary differential equation involves function and its derivatives. It contains only one independent variable and one or more of its derivatives with respect to the variable.

For Example

The general form of n-th order ODE is given as

$$F(x, y, y', \dots, y^n) = 0$$

# Partial Differential Equations

A Partial Differential Equation commonly denoted as PDE is a differential equation containing partial derivatives of the dependent variable (one or more) with more than one independent variable.

A PDE for a function  $u(x_1, \dots, x_n)$  is an equation of the form

# Applications of Differential Equations

- ❖ Differential equations describe various exponential growths and decays.
- ❖ They are also used to describe the change in return on investment over time.
- ❖ They are used in the field of medical science for modelling cancer growth or the spread of disease in the body.
- ❖ Movement of electricity can also be described with the help of it
- ❖ They help economists in finding optimum investment strategies.



# Other Types of Differential Equations

- ❑ Linear Differential Equations.
- ❑ Nonlinear differential equations.
- ❑ Homogeneous Differential Equations
- ❑ Nonhomogeneous Differential Equations.

# THANK YOU

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