

TRINITY COLLEGE FOR WOMEN NAMAKKAL Department of Mathematics

ORDINARY DIFFERENTIAL EQUATION 23PMA03– ODD SEMESTER

AN INTRODUCTION ON ODE

Presented by Dr.B.LENA Assistant Professor Department of Mathematics http://www.trinitycollegenkl.edu.in/ **Introduction to Ordinary Differential Equations** (ODE) **Recall basic definitions of ODE,** *order *linearity *initial conditions *solution **Classify ODE based on(order, linearity,** conditions) **Classify the solution methods**

CLASSIFICATION OF ODE:

ODE can be classified in different ways

Order

First order ODE Second order ODE Nth order ODE Linearity Linear ODE

Nonlinear ODE

Auxiliary conditions Initial value problems Boundary value problems SOLUTIONS:

Analytical Solutions to ODE are available for linear ODE and special classes of nonlinear differential equations.

Numerical method are used to obtain a graph or a table of the unknown function

We focus on solving first order linear **ODE** and second order linear **ODE** and **Euler** equation. FIRST ORDER LINEAR DIFFERENTIAL **EQUATIONS: Def:** A first order differential equation is said to be *linear* if it can be written y' + p(x)y = g(x)

Second Order Linear Differential Equations:

The general equation can be expressed in the form ay''+by'+cy = g(x)where a, b and c are constant coefficients Let the dependent variable y be replaced by the sum of the two new variables: y = u + v

Therefore

[au''+bu'+cu]+[av''+bv'+cv]=g(x)

If v is a particular solution of the original differential equation.

au''+bu'+cu = 0

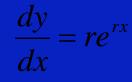
PURPOSE

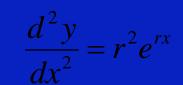
The general solution of the linear differential equation will be the sum of a "<u>complementary function</u>" and a "<u>particular</u>



THE COMPLEMENTARY FUNCTION (SOLUTION OF THE HOMOGENEOUS EQUATION): ay''+by'+cy = 0

Let the solution assumed to be: $y = e^{rx}$





$$e^{rx}(ar^2+br+c)=0$$

characteristic equation

Real, distinct roots Double roots Complex roots

THANK YOU

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