

MATH 2 Lecture Notes

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1 Chapter 1

1.1 Terminology

Definition A differential equation is an equation containing the derivatives or differentials of one or more dependent variables, with respect to one or more independent variables.

· An Ordinary Differential Equation (ODE) involves only ordinary derivatives

· A Partial Differential Equation (PDE) involves partial derivatives.

Definition The order of a DE is the order of the highest-order derivative that appears in the DE

Notation $F(x, y, \frac{dy}{dx}, \frac{d^2y}{dx^2})$

Definition A linear DE is any DE that can be written in form:

$$a_0(x)y + a_1(x)y' + a_2(x)y'' \cdots + a_n(x)y^{(n)} = b(x)$$

For a DE to be linear:

1. Y and all of its derivatives must be of the 1st degree
2. Any term that does not include y or any of its derivatives must be a function of x

1.2 Some Mathematical Models

I. Free-falling body

2 Example Problems with Solutions

2.1

$$\frac{dy}{dx} = y^2 + 2xy$$