Differential Equations

Part I

Introduction

Chapter 1

Differential Equations model the rate of change in a system

Part II

History

Part III

Method

Chapter 2

Basics

Chapter 3

Differential Equations

3.1 Notation

First order differential of y w.r.t x

$$\frac{d}{dx}y \tag{3.1}$$

$$\dot{y} \tag{3.2}$$

Second order differential of y w.r.t x

$$\frac{d^2}{dx^2}y \tag{3.3}$$

$$\ddot{y} \tag{3.4}$$

Chapter 4

Differentiation

The derivative of a function is defined as

$$\frac{df}{dx} = \lim_{h-0} \frac{f(x+h) - f(x)}{h} \tag{4.1}$$

4.1 Chain Rule

Given

$$f(x) = F(g(x)) \tag{4.2}$$

Then

$$\frac{d}{dx}f = \frac{d}{dg}F \cdot \frac{d}{dx}g \tag{4.3}$$

4.1.1 Examples

4.2 Product Rule

Given

$$f(x) = u(x)v(x) \tag{4.4}$$

Then

$$\frac{d}{dx}f = \frac{d}{dx}u \cdot v + u \cdot \frac{d}{dx}v \tag{4.5}$$

4.2.1 Examples

4.3 Trigonometric Functions