Doctoral Thesis Research Proposal

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2.1 Differential Equations

Differential equations have been used in disciplines ranging from engineering and physics, to economics, biology, and public health. The theory is marvelously rich, with contributions from the likes of Newton, The Brothers Bernoulli, and Euler to name just a few. Consequently, it can be difficult for applied practitioners to extract only the most useful information from the theory for their applications. This chapter does exactly this. We begin by examining under what conditions a unique solution to a differential equations exists. We then go on to classify different types of differential equation, as knowing what to what class the equation belongs will lend insight into how it may be solved. We will also examine methods of solution, systems of differential equations, and properties of numerical solutions.

2.1.1 What is a Differential Equation

2.1.2 Existence & Uniqueness

2.1.3 Classification of Ordinary Differential Equations

2.1.4 Solutions for Linear Ordinary Differential Equations

2.1.5 Systems of Ordinary Differential Equations

2.1.6 Numerical Solutions to Ordinary Differential Equations

2.1.7 Properties of Numerical Schemes