ABSTRACT

In this work, starting with one dimensional sytem of differential equation and then the higher dimensions and I describe the various quantitative and qualitative techniques of analysing the systems for their stability and behaviour. In the two dimensional case, I discuss the proof of the Poincarfe Bendixson theorem which implies that there can never be chaos in two dimensions. Later, giving an ordering for the natural numbers I state and give the proof of the Sarkovskii's theorem whose consequence is the important theorem by Li and Yorke that period three implies chaos. Apart from these, I have solved and plotted the trajectories for the Lorenz equations and the Rossler equations. Chapter 1 has been learnt from the Strogatz's book "Nonlinear Dynamics and Chaos" excepts for the proofs of the Existence and Uniqueness Theorem and the Poincare Bendixson Theorem which are referred from Lawrence Perko's book and Coddington and Levinson's book for differential equations respectively. Sections 2.1 and 2.2 are self written codes and plots. Sections 2.3 and 2.4 also come from the Strogatz's book while the last section has been referred from Robert Devaney's book. All the figures included also come from the Strogatz's book.