Study of non-linear differential equations in Hamiltonian and dissipative systems

MATH 26600

Rutuj Gavankar

1 Introduction

A system of linear ordinary differential equations can be analyzed analytically in most cases. The solution to such a system is well known. This report discusses the techniques to analyze a system of non-linear ordinary differential equations by analytical and numerical methods. The case of a first-order Hamiltonian system and a dissipative system will be analyzed.

1.1 Analyzing a system of non-linear ODE's

1. Let

$$\frac{\mathrm{d}x}{\mathrm{d}t} = F(x, y) \tag{1}$$

$$\frac{\mathrm{d}y}{\mathrm{d}t} = G(x, y) \tag{2}$$

   be a system of first-order differential equations. To find the steady state of the

2 Hamiltonian Systems

3 Dissipative Systems

References