Project 1, Numerical differential equations

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2.1 Introduction to the Problem

The goal in this part of the report is to model the spread of an infectious disease in a population. To do so, the population is divided into 3 categories, Infected (I), Susceptible (S) and Recovered (R). The three categories give rise to the so-called SIR model.

All infected individuals (I) are sick, and assumed to be infectious and able to spread the disease to susceptible individuals (S). The susceptible individuals (S) are healthy individuals who can become infected. The recovered individuals (R) are individuals who have recovered from the disease and are immune to it. By assumption, an individual who is recovered may also be dead. Soeone who is recovereed is not able to be infected again.

2.2 A mathematical model of the problem

Assume first that we only consider the amount of infected peaple at some location in space, and want to investigate how the disease affects a number of people at this location. The SIR-model that only depends on time would then look like this:

$$\frac{dS}{dt} = -\beta SI, \tag{1}$$

$$\frac{dI}{dt} = \beta SI - \gamma I, \tag{2}$$

$$\frac{dR}{dt} = \gamma I. \tag{3}$$