

22M:096:001
Epidemiology Module–Homework 1

The goal of this assignment is to use MATLAB to become familiar with approximate techniques for solving ODEs as well as understanding how to read phase planes.

1. Write a MATLAB program that solves the SIR system of differential equations using `sir_function.m` (ICON download) and MATLAB's 'ode45' solver.
 - (a) Assume that initially 1% of the population is infected and 99% is susceptible. Use $\beta = 12$ and $\gamma = 4$.
 - (b) What happens if the initial infected population is larger?
 - (c) What happens if some of the population is already immune?
2. Create a graph that compares the fractional populations of each compartment over time.
 - (a) What does the graph look like for an initial infected to susceptible ratio of 1%/99%?
 - (b) What happens to your graphs if you start with more infected people? with more immune people?
3. Create a phase plane (an s vs i graph) using your solutions from problem 1.