

## Homework 0 (do not hand in)

1. (ex. 1.4.2 from dV) Study the continuous and discrete models for the recovery of the infected individuals (from class):

a) vary the time increment  $\Delta t$  (e.g. try  $\Delta t = 0.25$  day,  $1/8$  day, 1 day, 10 day). What do you observe? Which choice of the parameter gives the best and which one gives the worst agreement? Can you explain why?

b) what happens as you vary  $\alpha$ ? Can you explain why?

You can do the above analytically, plotting the graphs yourself. Or you can use this problem to start learning about Matlab. Use

[www.math.utah.edu/~borisyuk/5110/compute.html](http://www.math.utah.edu/~borisyuk/5110/compute.html) to get started. You can run the code that I wrote for this problem (the file is next to this homework). See what it does, try to understand how and then modify it to do what you need.

2. (ex. 1.4.1 from dV) Assume you have a culture of bacteria growing in a petri dish, and each cell divides into two identical copies of itself every 10 minutes.

(a) choose a unit of time and find the corresponding probability of cell division.

(b) Write down a discrete-time model which relates the amount of cells at time  $t$  and  $t + \Delta t$ .

(c) Define the growth rate, and derive the corresponding continuous-time model.

(d) Solve both models and compare the solutions.