CIS 401: Problem Set 4

Essential Knowledge–Please give a brief answer (1-2 sentences) for each

1. How would you create a 10-by-20 array filled with random numbers. The numbers should be normally distributed with mean of 5 and standard deviation of 3.

2. How would you use fread to read a binary file filled with unsigned long integers?

3. You are an epidemiologist studying how modern life impacts how diseases spread. You hypothesize, that air travel allows diseases to spread faster (think SARS) by linking populations that are far apart (think Hong Kong and Toronto). You decide to take a theoretical approach similar to that of Watts and Strogatz. You plan to create networks along a spectrum from organized to random and then model how quickly disease spreads from a randomly selected node to another. Given a graph G of the kind returned by the function createlattice (used in the Small Worlds example in lecture 8) with n nodes, you have a function called infection that models how disease spreads to the communities represented by the nodes. The initial conditions for your run will be 0.01 (1% of the population) at the first node and 0 at the remaining $n-1$ nodes.

   (a) How would you use ode23 to run a simulation starting from the initial conditions above over the time interval of 0-365 days? The graph G is passed to infect as a parameter.

   (b) You want to do many runs where you will create a graph with the same number of nodes, but using a different probability p. Define a struct to help keep the information about the graphs and the output of the runs together

Programming

4. Send me a brief description of the problem you are trying to solve. This can be the same as PS3, but please don't assume I remembered anything.

5. Provide a brief description (in English) of how you attempted to solve this problem.

6. Send me the function or functions implementing your solution.

7. Provide an example of how to use your function(s). If your problem requires a specific set of data, please provide a small example.