CS 485 Assignment 4 due Feb. 24

1. Write a computer program to construct a random graph edge by edge until n edges have been inserted. Output the number of components of each size at several time steps to illustrate the emergence of a giant component.

2. Prove that the probability of generating a given undirected graph is the same for the following two algorithms. Algorithm 1: create the probability matrix and then randomly round each entry to 0 or 1 respecting symmetry. Algorithm 2: Randomly generate the degree of each vertex, create a vector of edge endpoints, randomly permute elements of the vector and pair end points.

3. Consider N_p . We say that a property has a threshold t(n) if for $p = f_1(n)$ where $\lim_{n \to \infty} \frac{f_1(n)}{t(n)} = 0$ N_p almost surely does not have the property and for $p = f_2(n)$ where $\lim_{n \to \infty} \frac{f_2(n)}{t(n)} = \infty$ N_p almost surely has the property. Does the property " N_p contains the integer 1" have a threshold? If so what is it?

4. In N_p what is the threshold for a) perfect square, b) perfect cube, c) even number, d) three numbers such that x+y=z.