Math 420, Spring 2017
First Team Homework

due Thursday, 23 February, 2017

Exercise 1. Consider an Erdös-Rényi random graph G with $n = 100$ vertices and probability $p = 0.9$ for each edge, i.e. $G \in \mathcal{G}_{100,0.9}$.

1. (1pt) What is the expected number of edges ?
2. (1pt) For each vertex v, the degree $deg(v)$ is defined as the number of edges that have v as one of end points. (Thus in a complete graph with n verticies, each vertex has degree $n-1$). For the random graph G, compute the expected degree of each vertex.
3. (1pt) Assume each edge of G is colored either in red, or in blue. Given an edge, assume the probability of being red is 30% whereas the probability of being blue is 70%. Determine the expected numbers of red edges and of blue edges.
4. (1pt) Detemine the expected number of 3-cliques.
5. (1pt) Detemine the expected number of 4-cliques.

Exercise 2. (5pts) Write a code (preferably in Matlab, or in your favorite implementation laguage) that computes the number of 3-cliques of a given graph. The function will have the following format:

Inputs:

1. n : integer, the number of vertices
2. m: integer, the number of edges
3. A: the $n \times n$ adjacency matrix

Output:

1. N_3: integer, the number of 3-cliques