

**Math 420, Spring 2018**  
**Second Team Homework**

due Thursday, 1 March, 2018

**Exercise 1.** [3pts] Assume a random graph  $G$  in class  $\Gamma^{n,m}$  with  $n = 1000$  vertices and  $m = 2000$  edges.

1. What are the expected numbers of 3-cliques and 4-cliques?
2. Can you estimate the probability that the graph  $G$  has exactly ten 3-cliques?
3. Can you estimate the probability that  $G$  is connected?

**Exercise 2.** [3pts] Assume a random graph  $G$  in class  $\Gamma^{n,m}$  with  $n = 1000$  vertices and  $m = 100,000$  edges.

1. What are the expected numbers of 3-cliques and 4-cliques?
2. Can you estimate the probability that the graph  $G$  has exactly ten 3-cliques?
3. Can you estimate the probability that  $G$  is connected?

**Exercise 3.** [4pts] Update the function `cliques.m` you wrote in Team Homework 1 to compute the cumulative count of 4-cliques. This means, update the code to work with  $p = 4$ . Then run it on your project data. Use `BKFRAT` for testing as in the previous homework.

1. `cliques.m` [2pts]: Update the Matlab function `cliques.m`
2. `teamXhw2.m` [2pts] Update the previous script to `teamXhw2.m`, run it on same datasets you used last time (or new datasets, if your project requires so), and plot the cumulative count of 4-cliques as function of number of edges.