

Math 420, Spring 2017
Second Team Homework
due Thursday, 2 March, 2017

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] Write a function that computes the number of 4-cliques for a given graph. Write a script that inputs the data file graph.dat (whose graph is included below), and computes both the sequence of 3-clique numbers and 4-clique numbers. Run the script on graph.dat and print out all the codes (functions and script) and results. The data file graph.dat has the following format:

```
First line: n m
Second line: Edge1Vertex1 Edge1Vertex2
Third line: Edge2Vertex1 Edge2Vertex2
...
m+1st line: EdgemVertex1 EdgemVertex2
```

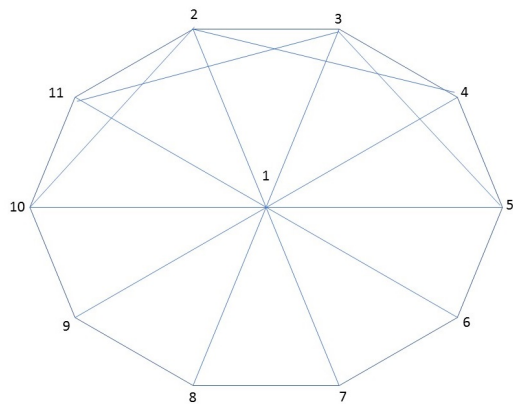


Figure 1: A graph with $n = 11$ vertices and $m = 24$ edges.