CSC 641 Network Science, Fall 2015
Instructor: Dr. Natarajan Meghanathan
Take Home Quiz 3
Due: Monday, Nov. 16, 2015: 6 PM

**Late submission (Nov. 16, 2015-6:10 PM to Nov. 17, 2015-6 PM: -30 points, taken off from your score)**
Late submission (Nov. 17, 2015-6:01 PM to Nov. 18, 2015-6 PM: -55 points, taken off from your score)
**No late submission allowed after Nov. 18, 2015-6 PM.**
Maximum Points: 75

1) (30 pts) For the graph assigned to you, find whether the links happened by chance? For this, do the following:
a) Find the frequency (probability) distribution of the degree of the vertices in the actual graph.
b) Find the average degree of the graph and use it as a parameter to determine a probability distribution of the vertices in a random graph.
c) Compare the probability distributions of (a) and (b) and arrive at your conclusion for the overall question posed above. Use a threshold value of 0.15 for the root mean square difference between the two Probability distributions.
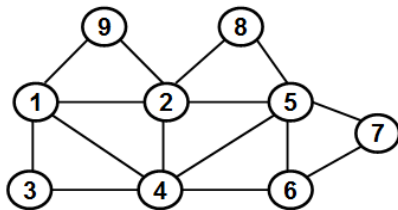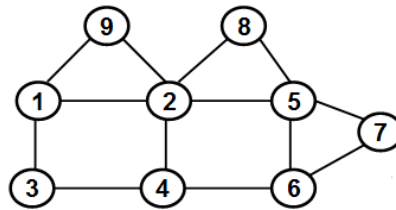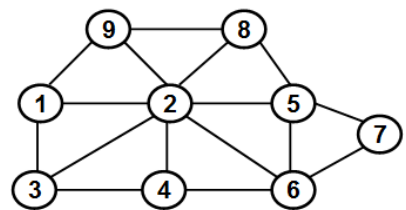
Karthik Reddy	Anirudh Reddy	Yashwanth Divanji

2) (15 pts) Consider real-world networks with the following number of nodes and links. If these networks were to evolve as a random network, determine the average degree and average path length as well as classify whether they belong to the subcritical, critical, supercritical or fully connected regime.

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(a) N = 100 nodes; L = 200 links	(a) N = 100 nodes; L = 400 links	(a) N = 100 nodes; L = 150 links
(b) N = 50 nodes; L = 150 links	(b) N = 50 nodes; L = 100 links	(b) N = 50 nodes; L = 200 links

3) (30 pts) Consider a random network generated according to the G(N, p) model where the total number of nodes is N and the probability that there are links between any two nodes is p. Determine the following:
(a) The probability that there are exactly X links in the network
(b) The average number of links in the network
(c) The average node degree
(d) The standard deviation of the node degree
(e) The average path length (distance between any two nodes in the network)
(f) The average local clustering coefficient for any node in the network.
(g) The expected local clustering coefficient for a node that has exactly Y neighbors.

	N	p	X	Y
Karthik Reddy	15	0.3	100	10
Anirudh Reddy	18	0.1	150	5
Yashwanth Divanji	20	0.05	185	6