Problem 1.

Problem 2.
Generate a network of 10,000 nodes using the Preferential Attachment algorithm that adds nodes 1 at a time, each with edges to \( m \) of the previous existing nodes (find code at stack overflow or at GitHub or write your own). Then solve the following 3 tasks:
(a) Plot on log-log scale the degree distribution at intermediate steps for networks of 100, 1,000 and 10,000 nodes.
(b) Compute the average clustering coefficient as a function of the number of nodes on these networks.
(c) Measure the degree dynamics of one of the initial nodes and of the nodes added to the network at time \( t=100, t=1,000 \) and \( t=5,000 \).

Problem 3.
Propose two topics that you would like to study independently as to present a lecture in class on one of these topics. These topics should be different from topics already discussed in class. Each topic should be appropriate for a 18 minutes presentation. For each topic list literature that you would use to prepare the lecture. Possible topics to consider (you can also consider different topics):
- Evolving networks
- Degree correlation
- Network robustness
- Communities in networks
- Spreading phenomena
- Epidemics on networks
- Weak ties
- Meme
- Advertising and recommendations
- Modeling network traffic
- Generative models for networks
- Voting
- Biological networks
- Industrial applications of information networks
- Network partitioning
- Percolation and network resilience
- Dynamical systems on networks
- Representation learning on networks (WWW 2018 tutorial)
- Antisocial behavior on the web (WWW 2017 tutorial)