CS 579 Homework #3 due by midnight on Fri Oct 3. Late submissions accepted until 5pm Oct 6.

1. Given the following adjacency matrix:

$$\begin{bmatrix} 0 & 2 & 3 & 3 & 0 & 2 \\ 2 & 0 & 1 & 1 & 0 & 0 \\ 3 & 1 & 0 & 0 & 1 & 0 \\ 3 & 1 & 0 & 0 & 1 & 2 \\ 0 & 0 & 1 & 1 & 0 & 0 \\ 2 & 0 & 0 & 2 & 0 & 0 \end{bmatrix}$$

   a. Draw and label the graph
   b. What is the probability of a node in this graph having degree 3?
   c. What is the diameter of the graph?
   d. Provide a table with the betweenness centrality, closeness centrality and strength for each node

2. Given the following adjacency matrix:

$$\begin{bmatrix} 0 & 1 & 1 & 1 & 0 & 1 \\ 1 & 0 & 1 & 1 & 0 & 0 \\ 1 & 1 & 0 & 0 & 1 & 0 \\ 1 & 1 & 0 & 0 & 1 & 1 \\ 0 & 0 & 1 & 1 & 0 & 0 \\ 1 & 0 & 0 & 1 & 0 & 0 \end{bmatrix}$$

   a. Provide the local clustering coefficient for each node
   b. Provide the global clustering coefficient for the graph
   c. Provide the degree sequence for each node

3. Given the following graph:
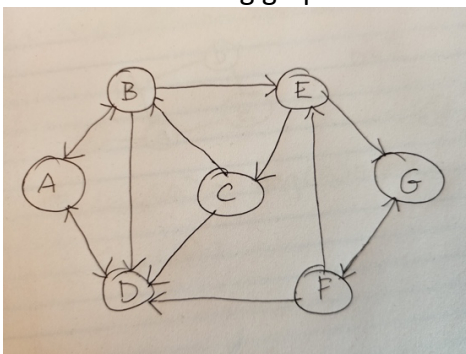
Using the simple PageRank algorithm from class, iterate until you have a stable rank. For each iteration, show the PageRank values and rank for each node.

4. Given the following adjacency matrix representing a flow network from v2 (source) to v5 (sink)

$$\begin{bmatrix} 0 & 0 & 5 & 6 & 0 & 0 \\ 3 & 0 & 4 & 7 & 0 & 0 \\ 0 & 0 & 0 & 3 & 0 & 2 \\ 0 & 0 & 0 & 0 & 4 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 8 & 7 & 0 \end{bmatrix}$$

a. Draw the initial flow network
b. Use the Ford-Fulkerson algorithm to determine the maximum flow through the network. For each iteration, show (1) the augmenting path, (2) the resulting flow network, (3) the residual network and (4) the flow value.