Homework 9

due November 12, 2024
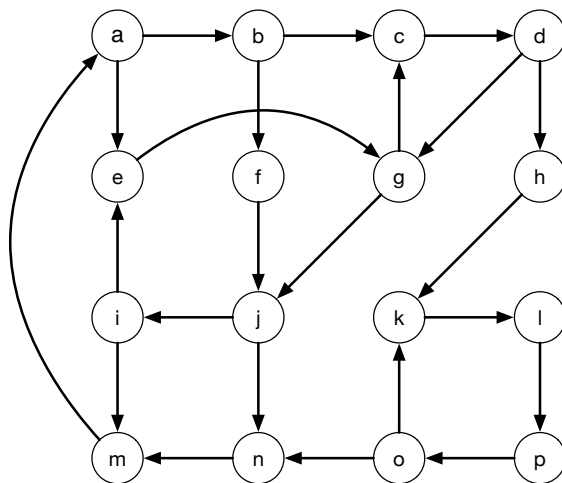
20 pts
Problem 1:

The reverse graph is a directed graph with the direction of all edges reversed. Mathematically, a directed graph is a pair (V, E) where V is a finite set of nodes and E is a subset of $V \times V$. The opposite graph is the pair (V, E') with $E' = \{(u, v) \mid (v, u) \in E\}$. Assume that a directed graph is given as an adjacency list. Give a linear time algorithm, $\Theta(|V| + |E|)$, to create the adjacency list of E'. Argue why no asymptotically faster algorithm is possible.
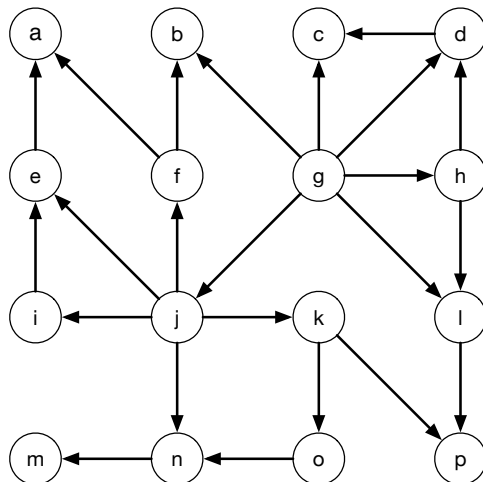
Problem 2:

Use the depth-first search algorithm to find a topological sort or determine its impossibility of the following graphs.
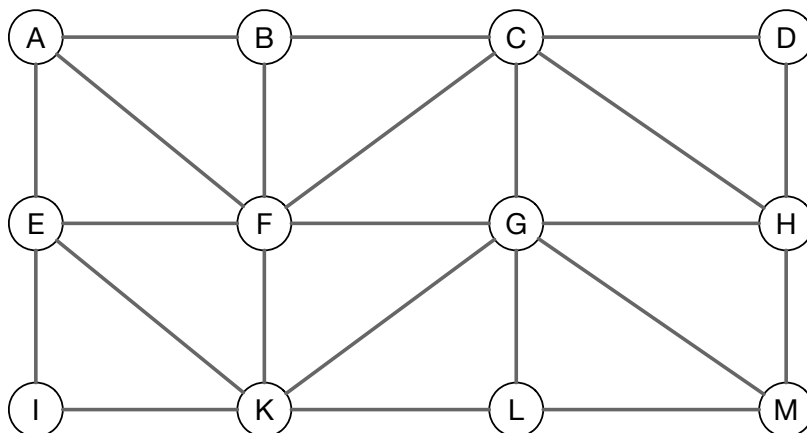
20 pts   (a)

20 pts   (b)

Problem 3:

Find a Hamiltonian circuit for the following graph. (You can give it by listening the nodes through with the circuit passes.):

Problem 4:

A complete n-k-partite graph has vertices that is partitioned into n subsets of k vertices each. The edges are all possible edges from nodes in one subset to the nodes in another subset. For example, the complete 4-3-partite graph is given below. Give a formula for the number of edges.