Summer 2009 **CMSC 351: Homework 9** Clyde Kruskal

Due at the start of class Friday, July 10, 2009.

Problem 1. Let $G = (V, E)$ be a directed graph.

(a) Assuming that G is represented by an adjacency matrix $A[1..n, 1..n]$, give a $\Theta(n^2)$-time algorithm to compute the adjacency list representation of G. (Represent the addition of an element v to a list l using pseudocode by $l \leftarrow l \cup \{v\}$.)

(b) Assuming that G is represented by an adjacency list $\mathrm{Adj}[1..n]$, give a $\Theta(n^2)$-time algorithm to compute the adjacency matrix of G.

Problem 2. Do Exercise 24.3-1 on page 600 of CLRS.

Problem 3. Give a simple example of a directed graph with negative weight edges, but no negative weight cycles, for which Dijkstra's algorithm produces incorrect answers.

Problem 4.

(a) What is the (optimization version of the) *Longest Acyclic Path Problem*?

(b) What is the decision version of the *Longest Acyclic Path Problem*?

(c) Show that the decision version of the Longest Acyclic Path Problem is in NP.