Analysis of Algorithms: Assignment 8

Due date: November 23 (Tuesday)

Problem 1 (3 points)
Using Figure 25.5 in the textbook as a model, illustrate the steps of Dijkstra's algorithm on the graph of Figure 25.2, with vertex y as the source (note that s is not the source).

Problem 2 (4 points)
Give an example of a directed graph with negative-weight edges for which Dijkstra's algorithm produces incorrect answers. Your graph must *not* include negative-weight cycles, which would make the shortest-path problem meaningless.

Problem 3 (3 points)
Using Figure 16.2 in the textbook as a model, draw the recursion tree for the MERGE-SORT procedure on a sixteen-element array. Explain why dynamic programming is ineffective for speeding up MERGE-SORT.

Problem 4 (bonus)
This is an optional problem, inherited from Exam 2, which allows you to get 2 bonus points toward your final grade. You cannot submit this bonus problem after the deadline.

Suppose that we consider *directed acyclic graphs* with V vertices. What is the maximal possible number of edges in a directed acyclic graph? Give a formula for the maximal number of edges, in terms of the number of vertices V, and explain why it is correct.