Analysis of Algorithms: Assignment 6

Due date: March 4 (Thursday)

Problem 1 (3 points)
Write algorithms for converting (a) an adjacency-list representation of a graph into an adjacency matrix and (b) an adjacency matrix into adjacency lists. Give the time complexity of your algorithms.

Problem 2 (3 points)
Using Figure 23.3 in the textbook as a model, illustrate the steps of breadth-first search on the directed graph of Figure 23.2(a), with vertex 3 as the source.

Problem 3 (4 points)
The depth-first search algorithm may be used to identify the connected components of an *undirected* graph. Write a modified version of DFS for performing this task.

Your algorithm must determine the number k of connected components in an undirected graph and return this number. Furthermore, for every vertex u of the graph, the algorithm must assign an integer label $component[u]$, between 1 and k, that denotes the corresponding connected component. If two vertices are in the same component, they must get the same label. On the other hand, if vertices are in different components, their labels must be distinct.