Analysis of Algorithms: Assignment 7 (Programming)
Due date: March 23 (Tuesday)

If you submit the assignment by 11am on March 18 (Thursday), then you will earn 2 bonus points toward your grade for this assignment (not toward the final grade for the course). If you submit it by 11am on March 20 (Saturday), you will get 1 bonus point.

Your task is to implement breadth-first search and depth-first search, in a programming language of your choice; both programs must be in the same language. Represent the vertices of an input graph by natural numbers, from 1 to n, and edges by adjacency lists. You may choose your own input format, whereas the output format must be as shown in the examples below. Submit a print-out of your programs and their output; make sure that the code is well-commented.

Problem 1 (5 points)
Implement a BFS program, which inputs a graph and source vertex, and outputs all vertices reachable from the source, in the order of painting them gray. For example, if you input the graph of Figure 23.2(a) in the textbook, with vertex 3 as the source, then the program may produce the following output:

BFS order of painting gray:
3 5 6 4 2

Note that a correct output is not unique, since it depends on the order of vertices in the adjacency lists. Thus, your program may output a different order for the same graph.

Apply your program to the graph in the picture below, with vertex 1 as the source, and submit the resulting output, along with the print-out of your code.

Problem 2 (5 points)
Implement a DFS program, which inputs a graph and outputs all its vertices, in the order of making them gray. The main loop of your program must process the vertices in their numerical order, from 1 to n. For example, if you run this program with the graph in Figure 23.2(a), then its output may be as follows:

DFS order of painting gray:
1 2 5 4 3 6

Submit a print-out of your program and the results of its application to the graph below.