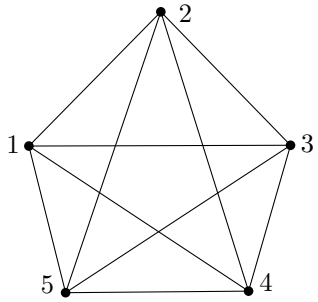
University of Freiburg
Dept. of Computer Science
Prof. Dr. F. Kuhn

Algorithms and Data Structures
Summer Term 2021
Exercise Sheet 8

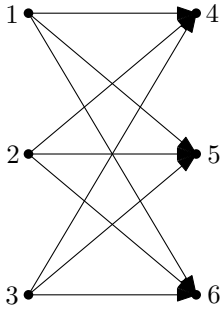
Exercise 1: Graph Representations

Give the following graphs as *adjacency matrix* and *adjacency list*.

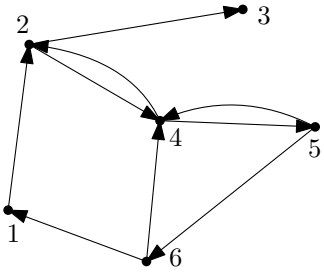
(a)



(b)



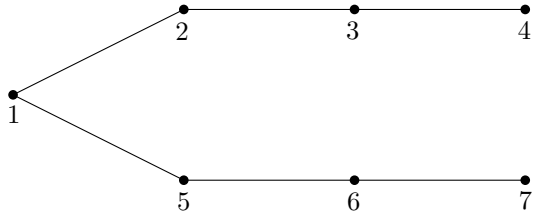
(c)



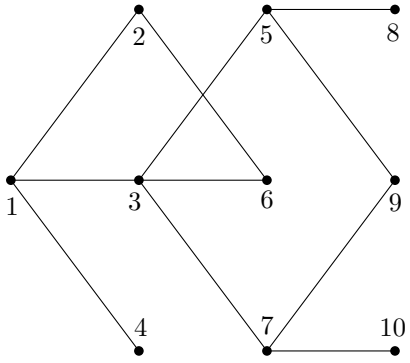
Exercise 2: Breadth First (BFS) and Depth First Search (DFS)

For the following graphs, give the order in which nodes are visited (marked) when running BFS and DFS. Moreover, mark the resulting spanning trees in the respective graph. Start with the node with identifier 1. Whenever there is a choice, mark the node with smallest identifier first.

(a)



(b)



Exercise 3: Check for Cycles

(a) Let $G = (V, E)$ be an undirected graph represented by an *adjacency list*. Describe an algorithm that tests in $\mathcal{O}(|V|)$ steps whether G has a cycle.

(b) Argue why your algorithm is correct and has the desired running time.