Problem 1. Consider the (2,3)-tree below:

```
  5 44
 /  \\
5 16 44 81
/      /     \
12 27 16 49 87
```

Show the (2,3)-tree after inserting 50.

Problem 2. Show the (2,3)-tree after deleting 27 from the tree in Problem 1.

Problem 3. Consider the following directed graph.

```
a
  b
  |
  c
   |
  d
     |
  e

f
g
h
i
```

Show a BFS-tree that can possibly produced by running the BFS algorithm starting from a.

Problem 4. Consider the graph in Problem 3. Is the following a possible order of the vertices visited (i.e., discovered) by any BFS execution?

```
d, e, c, g, f, a
```

Problem 5. Consider the graph in Problem 3. Show the DFS-trees obtained by running the DFS algorithm starting from a, and even a restart is needed, from h.

Problem 6. Consider the graph in Problem 3. Is the following a possible order of the vertices visited (i.e., discovered) by any DFS execution?

```
j, i, f, g, e, c, a, d, h, b
```

Problem 7. Let $G = (V, E)$ be a directed graph, given in the adjacency list format. Define a directed graph $G' = (V, E')$ where an edge $(u, v) \in E'$ if and only if $(v, u) \in E$ (namely, $G'$ reverses the direction of each edge in $G$). Describe an algorithm to obtain an adjacency list representation of $G'$ in $O(|V| + |E|)$ time.