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Advanced Algorithms
WS 2016/17
Homework 1

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Exercise 1:

Let us consider depth-first search of a directed graph. Let Q be the stack which is used for the organization of the search. Show that during the depth-first search the stack Q always contains a simple path from the start node to the top node of Q.

Exercise 2:

a) Develop an algorithm which decides in linear time if a given graph $G = (V, E)$ is bipartite or not.

b) Develop an algorithm which decides if a given graph $G = (V, E)$ is bipartite or not after the deletion of one edge. What is the run time of your algorithm? Can you give a linear time algorithm for this problem?

Exercise 3:

Construct a graph which contains a maximum matching of size ten and a maximal matching of size five.

Exercise 4:

Let $G = (V, E)$ be an undirected graph, M a maximal and M' a maximum matching of G. Prove $|M| \geq \frac{|M'|}{2}$.