

## Advanced Algorithms

### WS 2017/18 Homework 3

30.10.2017

#### Exercise 1:

Let  $G = (V, E)$  be a directed graph. What could be the change of the number of strongly connected components of  $G$  if we delete (insert) an edge?

#### Exercise 2:

Let  $G = (V, E)$  be a directed graph. Let  $G_{red} = (V_{red}, E_{red})$  be the reduced graph of  $G$  defined as in the lecture. Develop a linear time algorithm for the computation of the reduced graph for a given directed graph  $G$ . Take care that  $E_{red}$  does not contain multiple edges. Prove the correctness of the algorithm.

#### Exercise 3:

A directed graph  $G = (V, E)$  is called *half connected* if for every  $u, v \in V$  always a path from  $u$  to  $v$  or a path from  $v$  to  $u$  exists. Design an efficient algorithm which decides if a given graph  $G$  is half connected. Prove the correctness of your algorithm and analyze its time complexity.