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## Complexity of Boolean functions

SS 2018

### Homework 5

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#### Exercise 1:

Consider Situation 2 in the proof of Theorem 3.5 of the lecture. Show that both inputs of  $v$  can be fixed at one without changing the function computed by the network  $\beta$ .

#### Exercise 2:

Consider the proof of Theorem 3.5 again and prove the following assertions.

- a) If  $v \in I(Q_{ik})$  then  $v$  is an  $\vee$ -gate and either  $h_1 \leq b_{1k}$  or  $h_2 \leq b_{1k}$ .
- b) The sets  $I(Q_{ik})$  are pairwise disjoint.

#### Exercise 3:

- a) Give a formal definition of multilinear forms.
- b) Show that Boolean matrix product is a set of disjoint bilinear forms.
- b) Show that Boolean convolution is not a set of disjoint bilinear forms.