

Homework Complexity IBC028

To be handed in on the exercise session of March 15, 2019, no later than 11:00 AM.

This is the third and last set of homework exercises.

By handing in these homework exercises an extra bonus can be obtained for the examination: one full point if all three sets of homework exercises are done perfectly, and otherwise a corresponding part of one point.

Exercise 1.

Give an unsatisfiable CNF over three variables p, q, r in which every clause consists of three distinct literals.

Exercise 2.

A set of nodes in an undirected graph is called *independent* if no two nodes of them are connected by an edge. Prove that the problem to decide whether for a given graph and a number k , the graph contains an independent set of k nodes, is NP-complete.

Exercise 3.

A graph (V_1, E_1) is called a *subgraph* of a graph (V_2, E_2) if an injective mapping $f : V_1 \rightarrow V_2$ exists such that $(f(u), f(v)) \in E_2$ for all $(u, v) \in E_1$. The decision problem SUBGRAPH reads: given two graphs (V_1, E_1) , (V_2, E_2) , is (V_1, E_1) a subgraph of (V_2, E_2) ?

We want to prove that SUBGRAPH is NP-complete, using the fact that CLIQUE is NP-complete.

- (a) Describe what has to be proven for this.
- (b) Give the proof.