WS 2021/202 11.01.2021

Exercises to the lecture
Complexity Theory
Sheet 5

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Thomas Haas Delivery until 17.01.2022 at 15:00

Exercise 5.1 (Parameterized SAT)

Consider the following parameterized problem:

Boolean Satisfiability (SAT)	
Input:	A Boolean formula $\varphi(x_1, \ldots, x_k)$.
Parameter:	$k \in \mathbb{N}$.
Question:	Is there a satisfying assignment for φ?

Construct a search tree for SAT and show that the problem is FPT.

Exercise 5.2 (Unions of cliques)

A *clique* is a graph $K = (V, E)$ such that for all $u, v \in V$ we have $uv \in E$. This means that any pair of vertices has a connecting edge. The following problem asks how *far away* a given graph is from being a union of cliques.

Cluster Editing (CLUSTER)	
Input:	A graph $G = (V, E)$ and a $k \in \mathbb{N}$.
Parameter:	$k \in \mathbb{N}$.
Question:	Is it possible to add or remove at most k edges to/from E such that the resulting graph is a disjoint union of cliques?

a) Show that a graph G consists of disjoint cliques if and only if there are no three distinct vertices $u, v, w \in V$ with $uv, vw \in E$ and $uw \notin E$.

b) Prove that CLUSTER is FPT.

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