Exercises to the lecture
Complexity Theory
Sheet 10

Prof. Dr. Roland Meyer
Dr. Prakash Saivasan Delivery until 24.01.2017 at 17h

Exercise 10.1 (Parametrized SAT)

Consider the following parametrized version of SAT:
Input: A formula $\varphi(x_1, \ldots, x_k)$ of size n.
Parameter: $k \in \mathbb{N}$.
Question: Is there a satisfying assignment for φ ?

Construct a parametrized branching algorithm for the above problem and determine its runtime. Which part of the input makes SAT so expensive ?

Exercise 10.2 (Unions of cliques)

A **clique** is a graph $K = (V, E)$ such that for all $u, v \in V$ we have: $uv \in E$. Hence, any pair of vertices has a connecting edge. The goal of this exercise is to show that the problem *CLUSTEREDITING* defined below is FPT.
Input: A graph $G = (V, E)$.
Parameter: $k \in \mathbb{N}$.
Question: Is it possible to add or delete at most k edges to turn the graph into 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 $u, v, w \in V$ so that $uv, vw \in E$ and $uw \notin E$.

b) Prove that *CLUSTEREDITING* is FPT.
Hint: The criterion of Part a) can be used as a branching rule. So far, we have only considered binary branching trees. To solve the above problem, you may need a tree that has a bigger outdegree.

Delivery until 24.01.2017 at 17h into the box next to room 343 in the Institute for Theoretical Computer Science, Muehlenpfordstrasse 22-23