RWTH Aachen **WS 2018**
Lehrgebiet Theoretische Informatik Problem Set 9
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Parameterized Algorithms Tutorial

Tutorial Exercise T1

You are given an $n \times n$ matrix M and an integer parameter k. The goal is to select k non-zero entries S such that every other non-zero entry is either in the same row or same column as some element in S. Is this problem in FPT or W[1]-hard? Justify your answer.

Tutorial Exercise T2

Consider the following version of the Steiner Tree problem: an input is a graph $G = (V, E)$, a set $S \subseteq V$ and an integer parameter k; the goal is to decide whether there exists a set $T \subseteq V \setminus S$ of size at most k such that $G[T \cup S]$ is connected. Is this problem FPT or W[1]-hard? Justify your answer as usual.

Homework H1

Consider the following problem: Given a graph $G = (V, E)$ and integers k and l, decide whether G has k vertices V' such that the cut $(V', V \setminus V')$ has at least l edges. The parameter is k. Show that this problem is W[1]-hard on d-regular graphs, where d is sufficiently large in comparison to k.

Homework H2

The Dominating Set problem is W[2]-complete in general but in many well-known graph classes it is fixed-parameter tractable. For instance, it has a linear kernel on the class of planar graphs (and, in fact, on graphs of bounded genus, on H-minor-free graphs etc.). A colleague claims that the problem is FPT on bipartite graphs. Would you agree with your colleague? Justify your answer.