RWTH Aachen University **WS 2010/11**
Lehrgebiet Theoretische Informatik Tutorial 3
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Tutorial Exact Algorithms

Exercise T5

The problem Independent Dominating Set is defined as follows:

Input:	A graph $G = (V, E)$ and an integer k.
Question:	Is there a set $U \subseteq V$, such that $\|U\| = k$ and U is both, independent *and* dominating?

Which of the following reduction rules or solution strategies known for Independent Set and/or Dominating Set can be applied or slightly adjusted for this problem?

- Deletion of degree zero vertices
- Deletion of degree one vertices
- Folding
- Domination
- Reduction to Set Cover

Design an algorithm for this problem that for every k is exponentially faster than simple enumeration.

Exercise T6

The problem MaxCut is defined as follows:

Input:	A graph $G = (V, E)$.
Feasible solutions:	Any bipartition $V = V_1 \cup V_2$.
Goal:	Maximize the number of edges that are *cut* by the bipartition.

Design an algorithm or this problem with a running time of $O^*(\tau(3,3)^m)$, where as usual $m = |E|$.

Homework Assignment H5 (10 Points)

Let F be a formula in 3-CNF. A clause $\{l_1, l_2, l_3\}$ is *not-all-equal satisfied* if there are literals l_i, l_j such that l_i is true and l_j is false. A formula is *not-all-equal satisfied* by an assignment if each clause is not-all-equal satisfied.

Find an algorithm that decides whether a formula F in 3-CNF can be not-all-equal satisfied that is exponentially faster than simple enumeration, i.e., with a runnign time of $O^*(c^n)$, where $c < 2$ and n is the number of variables in F.

Homework Assignment H6 (10 Points)

Find an optimal *independent set* in the following graph (and mark the vertices in the solution). How big is your solution?