T-79.4201 **Spring 2006**
Search Problems and Algorithms
Tutorial 12, 5 May
Problems

[Only two problems this time.]

1. Consider the following *k-Set Splitting* problem: Given a collection $\mathcal{C}$ of k-element subsets of a finite set S, is there a subset $S' \subseteq S$ such that no $C \in \mathcal{C}$ is contained in either S' or $S - S'$ (i.e., S' "splits" all the sets in $\mathcal{C}$ in two pieces). The problem is NP-complete for $k \geq 3$. Make an educated guess concerning the location of "hard instances" for this problem.

2. Consider the problem for which you programmed a local search method in your first programming assignment. Can you identify a parameter β in the problem analogous to the clauses-to-variables ratio α of the Satisfiability problem? At which values of β would you guess that your problem would be most difficult to solve? [*Highly optional:* Make some relevant computer experiments using your existing local-search code, e.g.: (a) plot the time evolution of the problem's objective function for different types of input instances (if there is a lot of variance in the time series, take averages over several runs with different random number sequences); (b) try to experimentally determine the region of "hard instances" for the problem.]