

## Sample problems on approximation algorithms

Q1:

Consider the MAX-k-CNF-SAT problem: given a boolean expression in CNF form, with *at least*  $k$  literals in each clause where  $k$  is a constant  $\geq 4$  (with the standard conditions that no clause contains any literal twice, and no clause contains a literal and its negation), what is the maximum number of clauses that can be satisfied?

Give a randomized approximation algorithm for this problem, and determine the appropriate value of  $\rho$ .

Q2:

We have seen a 2-approximation algorithm for TSP, when the graph satisfies the triangle inequality.

Suppose the triangle inequality holds approximately. Formally, suppose we know that for any three edges  $x$ ,  $y$  and  $z$  that form a triangle in the graph, we are guaranteed that length of  $x < k(\text{length of } y + \text{length of } z)$ , where  $k$  is a constant  $\geq 1$ .

Derive a  $2k$ -approximation algorithm for TSP on such graphs, and prove that it is correct (i.e. prove that it always gets within a factor of  $2k$  of the optimal solution).