6.045J/18.400J: Automata, Computability and Complexity   Prof. Ron Rivest

Handout 16: Recitation Problems

25 April 2002   *Jonathan Herzog*

1. Show that $4 - SAT$ is $\mathcal{NP}$-complete.

2. An *independent set* in a graph G is a set S of nodes such that no two nodes in S have an edge connecting them. Let

   $$INDSET = \{\langle G, k \rangle \ : \ G \text{ is a graph with an independent set of size } k\}$$

   Show that $INDSET$ is $\mathcal{NP}$-complete.

3. Recall $MAXCLIQUE$ from the homework:

   $$MAXCLIQUE = \{\langle G, k \rangle \ : \ \text{the largest clique of } G \text{ has } k \text{ nodes}\}$$

   Show that if $\mathcal{P} = \mathcal{NP}$, then one can find the largest clique of a graph G in polynomial time.

4. One form of *traveling salesman problem* is the decision form:

   > Given a fully connected graph G with (integer) weighted edges, and an integer k, does there exist a Hamiltonian cycle of total weight k?

   This problem is $\mathcal{NP}$-complete. Show that if $\mathcal{P} = \mathcal{NP}$, then one can find the length of the "shortest" Hamiltonian of a graph G in polynomial time.