Handout 16: Recitation Problems

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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

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

   Show that *INDSET* is $\mathcal{NP}$-complete.
3. Recall *MAXCLIQUE* from the homework:

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

   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.