

Homework 3

CS 531
Winter 2000
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In each of the following decision problems,

- a) Give a reasonable length function,
- b) Give a pseudo-code algorithm which correctly accepts instances for which the answer to the question is yes, and
- c) Give an upper bound on the worst-case time or space complexity of your algorithm—as a function of the length of an instance (defined by the length function)—to justify your result.

1 Consider the decision problem TRAVELING SALESMAN defined on p. 18 of Garey and Johnson. Show that TRAVELING SALESMAN \in NP.

2 Consider the decision problem SATISFIABILITY defined on p. 39 of Garey and Johnson. Show that SATISFIABILITY \in NP.

3 Consider the decision problem QUANTIFIED BOOLEAN FORMULAS (QBF) defined on p. 171 of Garey and Johnson. Show that QBF \in PSPACE.

4 Consider the decision problem GRAPH ACCESSIBILITY PROBLEM (GAP) defined as follows:

Instance: An undirected graph $G = (V, E)$, and vertices $a, b \in V$.

Question: Is there a path in G from a to b ?

Show that GAP \in NL.