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

Homework 7

Due: 17 April 2002

Problem 1:

1. Exercise 7.6
2. Prove or disprove: if $L \in \mathcal{P}$ and $L' \subseteq L$, then $L' \in \mathcal{P}$.

Problem 2:

1. Exercise 7.7
2. Prove or disprove: if $L \in \mathcal{NP}$ and $L' \subseteq L$, then $L' \in \mathcal{NP}$.
3. Show that if $f = O(g)$ and $g = O(h)$ then $f = O(h)$

Problem 3: Exercise 7.10. Note that "polynomial" here means polynomial in the number of nodes in the graph. You can assume that the length of the representation of the graph is already polynomial in this sense.

Problem 4: For any function $t(n)$, show that there is a decidable language L which cannot be decided in running time t. That is, show that there exists a word w so that $w \in L$ cannot be decided in time $t(|w|)$. (Hint: consider the language of machine/word pairs $\langle M, w \rangle$ such that M does not accept the word w in less than $t(|w|)$ steps.)