MATH/CSCI 387

Homework 8

Due Tuesday, April 22

Practice exercises from the book

8.20, 8.21, 8.22, 8.27

Problems

1. Show that any PSPACE-hard language is also NP-hard. (Remember that "NP-hard" requires the same thing as NP-completeness, except that the language does not have to be in NP. PSPACE-hard is defined similarly.)

2. Let A be the language of properly-nested parentheses. For example, A contains (()) and ()(()()) but not ())(. Show that A is in L.

3. Let $A = \{x\#w \mid x \text{ is a substring of } w\}$. Show that $A \in L$.

4. Recall that $A_{NFA} = \{< M, w > \mid \text{such that } M \text{ is an NFA that accepts } w\}$. Show that this language is NL-complete.

5. Recall that $E_{DFA} = \{< M > \mid \text{such that } M \text{ is an DFA that accepts no strings}\}$. Show that this language is NL-complete.

Bonus problems

1. Let B be the language of properly nested parentheses and brackets. For example, ([]([]))[[]] is in B but ([)] is not. Show that B is in L.

2. Let $2SAT$ be the language of satisfiable boolean formulas written in conjunctive normal form with 2 variables per clause. (This is the same as $3SAT$ but with smaller clauses. However, unlike with $3SAT$, not all formulas can be reduced to a formula of this form.) Show that $2SAT$ is NL-complete.