UNLV CS456 Spring 2008 Homework 8

1. Give a context-free grammar for each of these languages.

   (a) The language of all strings of the form $a^i b^j$ such that $i \geq 2j$.

   (b) Binary numerals for multiples of 3, where leading zeros are not allowed. I cannot figure out how to do this one with fewer than four variables.

   (c) The language of all algebraic expressions over the variables x, y, z with the operators of addition $+$, subtraction -, multiplication $*$, exponentiation $*$, and negation -, and with parentheses. Your grammar must have only one variable, the start symbol.

2. Give an unambiguous context-free grammar for each of these languages.

   (a) The language of all strings of the form $a^i b^j$ such that $j \geq 2i$.

   (b) The language of all palindromes over $\{0, 1\}$.

   (c) The language of all algebraic expressions over the variables x, y, z with the operators of addition '+' subtraction '-' multiplication '*' exponentiation '$\hat{}$' and negation '-', and with parentheses. Your grammar must respect the usual precedence of operators. You will need at least three variables.

3. Write a polynomial time reduction of the knapsack problem to the partition problem.