Homework Assignment #11
Due: Thursday, December 4, 2014 at 4:00 p.m.

1. Let $L = \{x_1\#x_2\#\cdots\#x_k : k \geq 1,$ each $x_i \in \{\mathtt{0},\mathtt{1}\}^*$ and $\exists i, j$ such that $i < j$ and $x_i = x_j^R\}$. For example, `001001#0010#100100##00001` is in L because `001001` = $\mathtt{100100}^R$. Give a context-free grammar for L. You do not have to prove your answer is correct, but you must give, for each variable, a precise description of what strings are generated by that variable.

2. Consider the following grammar with starting symbol S.

$$S \to \mathtt{0}S\mathtt{11} \mid S\mathtt{1} \mid \mathtt{0}$$

Let $L = \{\mathtt{0}^i\mathtt{1}^j : i \geq 1 \text{ and } j \geq 2i - 2\}$.

Give a formal proof of the following claim: For all $n \geq 0$, every string of length n in L can be generated by the grammar.