CSCI 340 — Homework 9

Dr. Schwartz

1. Consider the grammar for the language $L = \{ a^n b^n \}$
   (a) Convert the grammar to CNF
   (b) Find all derivation trees that **do not** have self-embedded non-terminals
2. Why does the pumping lemma argument **not** show the language PALINDROME is not context free? Show how v and y can be found such that $w = uv^n xy^n z$ are also in PALINDROME no matter what w is.
3. How would you go about proving the following theorem?

   If L is a language over the one-letter alphabet $\Sigma = \{ a \}$ and L can be shown to be non-regular using the pumping lemma for regular languages, then L can be shown to be non-context-free using the pumping lemma for context-free languages.
4. Find CFGs for the following languages:
   (a) All words that start with a or are of the form $a^n b^n$
   (b) All words in EVEN-EVEN*
   (c) All words that start with ODD-PALINDROME and end with EVEN-PALINDROME
5. Find a CFG for $a^x b^y a^z$ where $x + z = y$
6. Which of the following are context-free?
   (a) EQUAL $\cap \{ a^n b^n a^n \}$
   (b) EVEN-EVEN' $\cap$ PALINDROME
   (c) $\{ a^n b^n \}' \cap$ PALINDROME