

Homework 3

Due: 8:00am Monday March 4 in Gradescope.

Only if you have a valid excuse (hospitalization, etc), you may submit by 8:00am Wed March 6 in Gradescope.

1. Show using the pumping lemma that the language

$$L_p = \{w \mid w = w^R, \text{ that is, } w \text{ is a palindrome} \}$$

is not regular.

2. Now show that the language

$$L_q = \{w \mid w \text{ is not a palindrome} \}$$

is not regular.

3. For the grammar G_2 on page 103, show that the string: the boy touches the girl with the flower has two different left-most derivations.

In plain English, explain the difference between the two meanings of this sentence.

4. Give context-free grammars that generate the following languages. Assume the alphabet $\Sigma = \{0, 1\}$.

(a) $L_1 = \{w \mid w = w^R, \text{ that is, } w \text{ is a palindrome} \}$

(b) $L_2 = \{w \mid \text{the length of } w \text{ is even and its middle two symbols are } 1s\}$

5. Give informal descriptions and state diagrams for pushdown automata for the languages L_1 and L_2 in the above question.