4200 - Formal Languages: Homework #6

Due on Nov 7, 2021 at 9:59pm

Instructor: Dr. Anh Nguyen

Problem 1

20 points
Problem **2.30** page 157 in the textbook.
Use Pumping Lemma for CFLs to prove the following language is not context-free.

$$A = \{\ 0^n\#0^{2n}\#0^{3n} \mid n \geq 0\ \}$$

Note: Alphabet $\Sigma = \{0, \#\}$. That is, # is a character in a string just like 0 or 1 in other languages discussed in this course.

Problem 2

20 points
Is the following language B context-free? If yes, show a context-free grammar (CFG) that generates B. If no, please prove it using Pummping Lemma for CFLs.

$$B = \{\ 0^n0^{2n}\#0^{3n} \mid n \geq 0\ \}$$

Note: B is the same as A in Problem 1, except that there is one less # in each string of B (compared to the strings in A).

Problem 3

20 points
Problem 2.31 (page 157) in the textbook.

2.31 Let B be the language of all palindromes over {0,1} containing equal numbers of 0s and 1s. Show that B is not context free.

Problem 4

20 points
Problem 2.32 (page 157) in the textbook.

2.32 Let $\Sigma = \{1, 2, 3, 4\}$ and $C = \{w \in \Sigma^* |$ in w, the number of 1s equals the number of 2s, and the number of 3s equals the number of 4s$\}$. Show that C is not context free.