CSCI 340 — Homework 1

Professor Killian

Due: January 27, 2019 @ 11:59PM

1. Consider the language S^*, where $S = \{aa\ b\}$. How many words does this language have of length 4? of length 5? of length 6? What can be said in general?
2. Consider the language S^*, where $S = \{aa\ aba\ baa\}$. Show that the words *aabaa*, *baaabaaa*, and *baaaaababaaaa* are all in this language. Can any word in this language be interpreted as a string of elements from S in two different ways? Can any word in this language have an odd total number of *a*'s?
3. Prove that for all sets S,
   (a) $(S^+)^* = (S^*)^*$
   (b) $(S^+)^+ = S^+$
   (c) Is $(S^*)^+ = (S^+)^*$ for all sets S?
4. Using any recursive definition of the set EVEN, show that all the numbers in it end in the digits 0, 2, 4, 6, or 8
5. Show that if n is less than 31, then x^n can be shown to be in POLYNOMIAL in fewer than eight steps
6. Give a recursive definition for the language PALINDROME. Make sure it works for even and odd length strings. $\Sigma = \{a\ b\}$
7. Give recursive definitions for the following languages. $\Sigma = \{a\ b\}$
   (a) the language EVENSTRING of all words of even length
   (b) the language ODDSTRING of all words of odd length
   (c) the language AA of all words containing substring *aa*
   (d) the language NOTAA of all words **not** containing substring *aa*