

CS 4810 Homework Assignment 5 due Monday class Sept 25

1. Write a version of the pumping lemma for regular sets that states that one can select any substring of the input x of length at least n and write that substring as uvw where one can pump on v . Write a precise statement of the lemma and then give a one or two sentence explanation as to why the lemma is true.
2. Construct a context-free grammar to generate the set of all strings of a 's and b 's in which the number of a 's does not equal the number of b 's. Give a sentence or two convincing us that your grammar generates the set.
3. Construct a grammar for the set $\{a^i b^j c^k d^l \mid i + k = j + l\}$
4. The grammar $S \rightarrow aSbS \mid bSaS \mid \epsilon$ generates all strings with an equal number of a 's and b 's. Construct a grammar to generate all strings where the number of blocks of a 's equals the number of blocks of b 's. An example of such a string is $aaaaabaabbb$. There are two blocks of a 's and two blocks of b 's. In constructing your grammar did you discover something interesting?
5. Construct a pushdown automaton to accept the set of all strings of a 's and b 's having an equal number of a 's and b 's.