

CS 4810 Homework Assignment 9 due in class October Oct 29

Your homework will be graded on the neatness of your write up as well as its correctness.

1. The pumping lemma states that if L is a cfl, there exists an integer n such that for $z \in L$, $|z| > n$, z can be written $z = uvwxy$ where $|vwx| \leq n$, $vx \neq \epsilon$ and $uw^iwx^iy \in L$. Assume there is a cfg in Chomsky Normal Form for L with s variables. Write a careful proof of the pumping lemma and specify the integer n in terms of the number of variable s in the Chomsky Normal Form grammar. Make sure you inequalities are correct.
2. Write a proof that every context-free language over a one symbol alphabet is a regular set. Your write up should be of the quality of material submitted to a journal for publication and will be graded on the quality of exposition and writing.
3. Create context-free grammars G_1 and G_2 such that
$$L(G_1) \cap L(G_2) = \{1010^210^31 \cdots 10^i1 | i \geq 1\}$$
4. Explain how you would prove that the class of context-free languages is closed under inverse homomorphisms. A few sentences are sufficient to convince us that you could write out a proof.
5. Is $\{a^ib^jc^k | i > j + k \text{ or } j = k\}$ a context-free language? Provide a proof that your answer is correct.