

Please write your name and net id on all pages turned in. We need net id to record your grade. If you turn in each problem on a separate sheet we will grade your problems in parallel and get your assignment back to you by the following Wednesday. If you turn in homework not on separate sheets we will circulate your homework and grade the problems in serial and thus it will likely be delayed somewhat in getting back to you.

1. Use the pumping lemma for regular sets to show that $\{ww^R \mid w \in (a+b)^*\}$ is not a regular set.

2. Let $L = \{a^n b^n c^n d^n \mid n \geq 1\}$. Show that L can be expressed as the intersection of two context-free languages.

3. Show that

$$\{01001000100001 \cdots 10^n 1 \mid n > 0\}$$

is the intersection of two cfl's..

4. Write a cfg for the set of all strings of balanced parentheses. The parentheses must be properly nested. Some sample strings in the language are $((()))$, $((()((()))))$, etc.

5. Give an simple English description of how to convert a multi state pda to a single state pda.

6. Use the pumping lemma to show that $\{a^i b^j c^k \mid i < k \text{ and } j > k\}$ is not a context-free language.