CS 383
HW 4

Due in class Friday, October 11 though it would help you to do the first four problems before taking Exam 1

This one should be typed.

1. Remember quotient languages from HW 3: If L is a regular language over Σ and a $\in \Sigma$ then L/a is the set of strings w such that wa is in L. Either prove or disprove the following identities:
    a. (L/a)a = L
    b. (La)/a = L
2. Suppose L is a regular language. Show that min(L) is also regular, where min(L)= {w | w is in L but no proper prefix of w is in L}
3. Suppose L is regular. Show that prefix(L) is also regular, where prefix(L) = {w | wx is in L for some x (including x=ε)}. prefix(L) is the set of all prefixes of all strings in L. These don't need to be proper prefixes, so L is a subset of prefix(L)
4. For any language L let powers(L) = {x^n | n >= 0 and x $\in$ L}. Find an example where L is regular but powers(L) is not regular.
5. Design a context-free grammar for {0^n1^n | n>=1}
6. Design a context-free grammar for {$a^ib^jc^k$ | i != j }
7. Here is a context-free grammar:

    S => aS | Sb | a | b

    Prove by induction on the string length that no string in the language represented by this grammar has ba as a substring.