Name________________________

Homework #2

People I worked with and URL's of sites I visited:

#1. Convert to Chomsky Normal Form. Please follow the steps even if you can "see" the answer:

a) the expression grammar, G:
E → E + T | T
T → T * F |F
F → (E) |a

b) S → A | A B a | A b A
A → A a | λ
B → B b | B C
C → C B | C A | b B

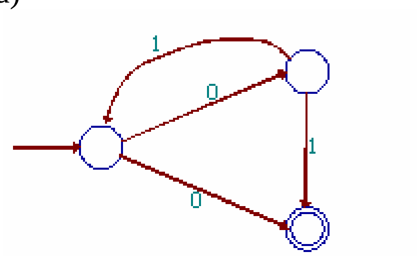
#2. Show the following languages are regular by creating finite automata with L = L(M)

a) Strings over {a,b} that contain 2 consecutive *a*'s
b) Strings over {a,b} that do not contain 2 consecutive *a*'s
c) The set of strings over {0,1} which contain the substring *00* and the substring *11*
d) The set of strings over {a,b} which do not contain the substring *ab.*

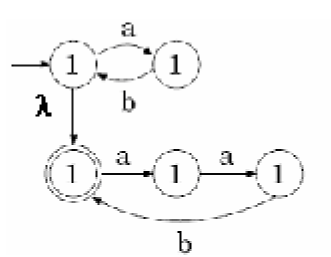
Show your answers in both table and graph form.

#3. Describe L(M) for the following nfa's: a) in words and b) as a regular expression

a)



b)



#4. a) Create an NFA (with λ transitions) for all strings over {0, 1, 2} that are missing at least one symbol. For example, *00010*, *1221*,and *222* are all in L while *221012* is not in L

b) Given an NFA with several final states, show how to convert it into one with exactly one start state and exactly one final state.

c) Suppose an NFA with k states accepts at least one string. Show that it accepts a string of length k-1 or less.

d) Let L be a regular language. Show that the language consisting of all strings not in L is also regular.

#5. a) Consider the extended transition function, δ^*, defined by:

$$\delta^*(q,\lambda) = q$$
$$\delta^*(q,wa) = \delta(\delta^*(q,w),a)$$

a) Show that $\delta^*(q,a) = \delta(q,a)$ (follows from the definition)

b) Show that $\delta^*(q, uv) = \delta^*(\delta^*(q,u),v)$ (use induction)

c) Show that $\delta^*(q,aw) = \delta^*(\delta(q,a),w)$ (follows from above)