Homework #1

Name_____

Worked with (list all people you discussed this homework with):

Each question is worth 1 points.

#1. Let Given the alphabet $\Sigma = \{a,b\}$, and the languages over Σ: $L_1 = \{aaa\}^*$, $L_2 = \{a,b\}\{a,b\}\{a,b\}\{a,b\}$ and $L_3 = L_2^*$, describe the strings in

a) L_2
b) L_3
c) $L_1 \cap L_3$

#2. Give regular expressions for the following:

a) The set of strings over {a,b,c} where all the a's precede all the b's which precede all the c's (there may be no a's, b's or c's)

b) The set of strings over {0,1} which contain the substring *00* and the substring *11*.

c) The set of strings over {a,b} which do not contain the substring *ab*.

#3. Let R1 = {a a a}*, R2 = {a, b}{a, b}{a, b}{a, b}, R3 = R2*. Describe:

a) R1 ∩ R3
b) What is the cardinality of R1 ∩ R3?

#4. Prove that regular languages are closed under reversal; that is, if L is regular, then L^R is regular.

#5. Explain briefly and clearly why (how) all finite alphabets can be replaced with a two symbol alphabet. Do this in general (for any length alphabet) and then show your method for the alphabet {a,b,c} and the string *b b c a*. Hint: The easiest solution has nothing to do with binary numbers.