Homework #1

Name_____

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

Each question is worth 10 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 G be the grammar:

$S \rightarrow 0 \mid 1 \mid 0 \ S \ 0 \mid 1 \ S \ 1 \mid \lambda \mid 0 \ 0 \mid 1 \ 1$

   a) Show a leftmost derivation of *0 1 1 1 1 0*

   b) Create a parse tree for *0 1 1 1 1 0*

   c) Show that this grammar is ambiguous

   d) Describe L(G) using set notation

#4. Construct grammars to generate the languages of #2

#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*.