CS4850 Homework Assignment #1

Due Date: *Tuesday, September 17, 2013 at 8am*

1. (5 pts. each) Give a regular expression for the following languages :

   (a) The set of strings over $\Sigma = \{a, b, c\}$ containing exactly one a.

   (b) The set of strings over $\Sigma = \{a, b, c\}$ containing an even number of c's.

   (c) The set of strings over $\Sigma = \{a, b\}$ of length greather than three.

   (d) The set of strings over $\Sigma = \{a, b, c\}$ that contain the substring ab.

   (e) The set of strings over $\Sigma = \{a, b\}$ of the form $a^n b^m$ where $n + m$ is even.

   (f) The set of strings over $\Sigma = \{a, b\}$ that contain the substring aa and the substring bb.

   (g) The set of strings over $\Sigma = \{a, b, c\}$ that begin with an a, have exactly two b's and end with cc.

2. (9 pts.) Let G be the grammar

   $S \rightarrow \ abSc \mid A$
   $A \rightarrow \ cAd \mid cd$

   (a) Give a derivation of $ababccddcc$.

   (b) Build the derivation tree for part 2a.

   (c) Use set notation to define $L(G)$.

3. (3 pts. each) For each of the following grammars, give set notation to describe the language generated by the grammar.

   (a)
   $S \rightarrow \ aaSB \mid \lambda$
   $B \rightarrow \ bB \mid b$

   (b)
   $S \rightarrow \ aSbb \mid A$
   $A \rightarrow \ cA \mid c$