COT 5310: Theory of Computation I
Homework 1

Due *in class* on Thursday, September 10, 2015

1. **[10 points]** Solve Sipser exercises 0.3, 0.4, 0.5, and problem 0.10

2. **[15 points]** For a DFA, $M = (Q, \Sigma, \delta, q_0, F)$ in which the set of states is $Q = \{q_1, q_2, q_3, q_4, q_5\}$, $\Sigma = \{a, b\}$, $q_0 = q_1$, $F = \{q_2, q_3, q_4, q_5\}$, and δ is specified by the table :

δ	q_1	q_2	q_3	q_4	q_5
a	q_1	q_3	q_5	q_2	q_4
b	q_2	q_4	q_1	q_3	q_5

   Do the following:

   (a) Draw the state diagram of the DFA.

   (b) For the strings below, give the corresponding computation of the automaton and say whether it accepts or rejects them. The definition of computation is given in page 40.
   -baab
   -abbb
   -bbba
   (c) Give a succinct English description of the strings accepted by M

3. **[10 points]** For each of the following languages give a state diagram of a DFA that recognize it. The alphabet is $\Sigma = \{0, 1\}$

   a) $\{w | w$ does not contain 000 or 11 as a substring$\}$
   b) $\{w | w$ contain at least two 0's and at least two 1's$\}$. The 0's and 1's do not need to be consecutive.

4. **[15 points]** Solve Sipser exercises 1.6 b, 1.6 d, 1.5 c, 1.4 c