CSE 322
Homework 3

1. (20 points) Give state-diagrams for deterministic finite automata accepting each of the following languages over the alphabet $\Sigma = \{0, 1\}$. Also, give a formal description of the DFA for the first of the following languages.

   (a) $L_1 = \{w | w \in \{0,1\}^*$,$w$ has an odd number of 0's and an even number of 1's$\}$.

   (b) $L_2 = \{w | w \in \{0,1\}^*$,$w$ begins with 1, and when interpreted as an integer is divisible by 5$\}$.

   (c) $L_3 = \{w | w \in \{0,1\}^*$, each 0 in w is immediately preceded by a 1$\}$.

2. (20 points) Give nondeterministic finite automata (with ε-transitions if needed) that recognize the following languages. Try to take advantage of nondeterminism as much as possible.

   (a) The set of strings of 0's and 1's such that there are two 0's separated by a number of positions that is a multiple of 3. (Note that 0 is an allowed multiple of 3.)

   (b) The set of strings of 0's and 1's which contain a 1 among the last six positions.

3. (20 points) Sipser 1.17

4. (20 points) Sipser 1.15

5. (20 points) Sipser 1.31