CISC 301
Homework 7
Due on Tuesday November 15, 2005
NO LATE SUBMISSIONS

1. (10 + 5 = 15 points)

a. Let $M_1 = (Q_1, \Sigma, \delta_1, s_1, F_1)$ and $M_2 = (Q_2, \Sigma, \delta_2, s_2, F_2)$ be two finite state automata. Construct a finite state automaton that accepts $L(M_1) - L(M_2)$. (If A and B are two sets then $A - B = \{x \mid x \in A \quad \& \quad x \notin B\}$.)
Hint: Think about the product construction.

b. Give a DFA to accept the set of strings of $a's$ and $b's$ where the number of $a's$ is divisible by 3. Also give one to accept the set of strings of $a's$ and $b's$ where the number of $b's$ is even. Call these two DFA's M_1 and M_2 respectively. (i) What is $L(M_1) - L(M_2)$? (ii) Apply the construction in part a. of this question to construct an automaton to accept this language, $L(M_1) - L(M_2)$.

2. (7 + 8 + 7 + 8 = 30 points)

For each of the following four languages, give a finite state automaton to accept it. Assume $\Sigma = \{a, b\}$ for first two languages, $\Sigma = \{a, b, c\}$ for the third language and for the fourth language, assume $\Sigma = \{0, 1, \ldots, 9, .\}$.

a. The set of strings that do not contain three consecutive $a's$.

b. The set of strings (of length at least three) where any contiguous substring of length three contains at least 2 $a's$. For example, aababa should not be accepted.

c. set of strings that contain exactly 2 occurence of "a" and 2 or more occurences of "b".

d. Fixed-decimal literals with no superfluous leading or trailing zeros. Every literal has at least one digit before and after the decimal point. Thus, for example, 0.0, 1.0, 0.1, 123.01, and 123005.0 are legal, but 0, .12, 23., 01.0, 1.000, and 002345.1000 are not.

3. (3 + 6 + 6 = 15 points)

a. Exercise 3 on Page 316 of text.

b. Exercise 5 b (you don't need to answer 5a) on Pages 316-317 of the textbook.