Department of Computer Science, University of Houston
COSC 3340 - Exercise set 1
Fall 2008, Due Thu. 9/25 at 10am
Staple all sheets together. No unstapled homeworks will be accepted.

Remember the academic honesty policy for the course. All work turned in **must** be your own. Searching/downloading from internet or other text books for solutions is not allowed unless specifically allowed for a question. For each problem that you discuss with students in class (you cannot discuss with anybody not in the class except the TA and instructor), note down their names in the solution.

Part 1: Submit via email to TA

1. Using JFLAP design DFA's for:

   (a) $\{w \in \{0,1\}^* \mid w$ does not contain the substring 001$\}$. Save this DFA in file 1hw1a (note that an extension of .jff will automatically be added, you do not need to type it).

   (b) $\{w \in \{0,1\}^* \mid$ |number of 0's in w − number of 1's in $w|$ is even$\}$. Save this DFA in file 1hw1b.

   Run the DFAs for parts (a) and (b) on JFLAP with at least 3 strings in the language and at least 3 strings not in the language. List the test strings and the verdicts of JFLAP with your solutions. Email the files along with strings you tried and the verdicts to the TA.

2. Using JFLAP build NFAs for: (a) $\{w \in \{a,b,c\}^* \mid w$ is of length at least two and either the secondlast symbol of w is a c or every a in w is separated from every b by at least one $c\}$. Save it in file 1hw2a.

   (b) $\{w \in \{a,b\}^* \mid w$ has at least one b and no more than two a's $\}$. Save it in file 1hw2b.

   Same instructions for NFAs as for DFAs after part (b) above.

Part 2: Bring to Class.

1. Define the reflexive and transitive closure of a binary relation R on a nonempty set S. Let Z denote the set of integers. Let binary relation R on Z be $\{(x,y) \mid x = y+2\}$. What is the reflexive and transitive closure of R? Justify your answer.

2. Claim: In any sequence of n^2+1 distinct numbers there is either a monotonically increasing subsequence or a monotonically decreasing subsequence of $n+1$ numbers. What proof technique is the most appropriate to prove this claim? Prove the claim.

3. Literature search is allowed for the following question. In no more than one page state the contributions of Georg Cantor that are relevant to the theory of computation and explain their relevance in brief. Remember to cite all your sources.