Department of Computer Science, University of Houston
COSC 3340 - Exercise set 1
Fall 2004, Due Tue. Sept. 21 at 4pm
**Staple** all sheets together. No unstapled homeworks will be accepted.

1. Design DFA's for:

   (a) $\{w \in \{0,1\}^* \mid w \text{ does not contain the substring } 001\}$.

   (b) $\{w \in \{0,1,2\}^* \mid w \text{ has either even number of 1's or the pattern } 0u2 \text{ for some string } u\}$.

   Run the DFA for part (a) 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. Hand-in screen printouts of JFLAP decision.

2. Let $Z$ denote the set of integers. Let binary relation $R$ on $Z$ be $\{(x,y) \mid x = y^2\}$. What is the reflexive closure of $R$? symmetric closure of $R$? transitive closure of $R$? Explain your answer in each case.

3. Determine, with clear and brief justification, the precise relationship ($\in$, $\notin$, $=$, $\subset$, $\supset$, or incomparable) between each pair of items below:

   (a) $(\ abcd, (a(cd)^*b)^*\ )$

   (b) $(\ a^*b^*, (a^*b^*)^*\ )$

   (c) $(\ (a \cup b)^*, (a^*b^*)^*\ )$

   (d) $(\ (a^*b)^*, (ab^*)^*\ )$

4. (a) Design an NFA with at most four states recognizing the language $\{w \in \{0,1,2\}^* \mid w = 0u1$ for some string $u$ containing at least one $2\}$. Run the NFA 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. Hand-in screen printouts of JFLAP work.

   (b) Design an NFA for the 1st regular expression in Question 3(d) and convert your NFA into a DFA.