Automata Theory - Homework I

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1 Instructions

1. The homework is due on February 6, in class.
2. Attempt as many problems as you can. You will be given partial credit.

2 Problems

1. Given sets $R$, $S$ and $T$, show that

$$R \cap (S \cup T) = (R \cap S) \cup (R \cap T)$$

(2 points)

2. Argue using Mathematical Induction

$$\sum_{i=1}^{n} i^3 = \left[ \frac{(n)(n + 1)}{2} \right]^2$$

(3 points)

3. Draw the transition diagram for a DFA accepting all strings $x \in \{0,1\}^*$, having 011 as a substring. (2 points)

4. Convert the NFA $N = \langle Q, \Sigma, \delta, q_0, F \rangle$ to a DFA, where

- $Q = \{p,q,r,s,t\}$,
- $\Sigma = \{0,1\}$,
- $\delta = \begin{array}{c|cc}
    & 0 & 1 \\
    p & \{p,q\} & \{p\} \\
    q & \{r,s\} & \{t\} \\
    r & \{p,r\} & \{t\} \\
    s & \phi & \phi \\
    t & \phi & \phi
  \end{array}$

- $q_0 = p$,
- $F = \{s,t\}$

(3 points)