CS311 – Computational Structures – HW2

Thursday, April 7, 2011
due in class Thursday, April 14, 2011

Answer each question below. Write your answers neatly on paper. Be sure your name is on the paper, and the paper is clearly identified as Homework 2.

1. Problem 5, Section 11.1, page 703 of the text. Simplify regular expressions. Justify steps using properties from 11.1 (a **3** pts, b **3** pts, c **6**pts).

2. Problem 1, Section 11.2, page 726 of the text. Transition function DFA. (8 pts).

3. Problem 2, Section 11.2, page 726 of the text. Create DFA from Reg Exp. (a **3**pts, b **3** pts, c **3** pts, d **3** pts, e **3** pts, f **6** pts).

4. Problem 3, Section 11.2, page 726 of the text. Word Problem, DFA for Rational constant. (10 pts).

5. Problem 4, Section 11.2, page 727 of the text. Transition function NFA. (8 pts).

6. Problem 5, Section 11.2, page 727 of the text. Create NFA from Reg Exp. (a **3** pts, b **4** pts, c **4**pts).

7. Prove by induction that for any natural number n, the sum of the first n natural numbers is equal to n(n + 1)/2. Do this on your own. Don't look it up anywhere.

   - What is the induction variable? (2 points)
   - What is the formula as a function of the induction variable. (2 points)
   - Use the forumula to describe the stucture of the proof. (4 points)
   - Carry out the steps of the proof, label each step. (4 points)
   - Write down any facts about arithmetic that you use in your proof. (4 points)

8. Draw a DFA with 3 or more states. (2 points)

   - Describe the language described by that DFA in English. (4 points)
   - Draw a second DFA which accepts the language of the reverse of the strings accepted by. I.e. if "abc" is accepted by the first DFA, then "cba" is accepted by the second. (4 points)
   - Describe in general terms how you derived the second DFA from the first DFA. (4 points)