Homework Set #3

Assigned: Thursday, 2/26

Due: Tuesday, 3/10 (start of lecture)

This assignment covers textbook material in Chapter 1, sections 1.3-1.4.

Note: Refer to course web site for homework policies.
Remember to attach signed honor statement.

1. (25 points) DFA's and Regular Expressions: Starting with the DFA below, please follow the process of first creating a GNFA for the DFA then applying “rip” operations to arrive at a regular expression. Rip out states in this order: \(q_2, q_1, q_0\). Use the proof of Lemma 1.60 in the textbook as a guide.

![DFA Diagram]

2. (25 points) NFA's and Regular Expressions: Consider the language:

\[ L_1 = \{w \mid w \text{ is of the form } \Sigma(a^+b \cup a)^* \} \text{ for alphabet } \{a,b\}. \]

a) (2 points) Give 2 examples of strings that are in \(L_1\).

b) (2 points) Give 2 examples of strings that are not in \(L_1\).

c) (21 points) Convert the regular expression \(\Sigma(a^+b \cup a)^*\) to an NFA using the process described in the textbook in the proof of Lemma 1.55. Only the state diagram of the NFA is required rather than the entire 5-tuple.

3. (25 points) Regular Languages: Textbook Problem 1.29(b) on p. 88.

4. (25 points) Regular Languages: Is the following language \(L_2\) regular? Prove or disprove. The alphabet is \(\Sigma = \{a,b\}\).

\[ L_2 = \left\{a^n b^{3n} \mid n \geq 0, n \in \mathbb{Z} \right\}. \]