Homework Set #3

Assigned: Friday, 9/19 Due: Wednesday, 10/1 (start of lecture)

This assignment covers textbook material in Sections 1.3-1.4.
Note: Refer to course web site for homework policies.
Remember to attach signed honor statement.

1. (20 points) **DFA’s and Regular Expressions**: Starting with the DFA $M_2$ in Problem 1 of HW#2, please follow the process of first creating a GNFA for the DFA then applying "rip" operations to arrive at a regular expression. Use the proof of Lemma 1.60 in the textbook as a guide.

2. (30 points) **NFA’s and Regular Expressions**: Consider the language:

   $$L_3 = \{w \mid w \text{ is of the form } (a \cup b)^* b^+ \Sigma \} \text{ for alphabet } \{a,b\}.$$  
   
   a) (4 points) Give 2 examples of strings that are in $L_3$.  
   b) (4 points) Give 2 examples of strings that are not in $L_3$.  
   c) (22 points) Convert the regular expression $(a \cup b)^* b^+ \Sigma$ 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 1.46(d) on p. 90.

4. (25 points) **Regular Languages**: Is the following language $L_4$ regular? Prove or disprove. The alphabet is $\Sigma = \{a,b\}$.

   $$L_4 = \{ a^n b^j \mid n = j^2, \ j \in N \}.$$