1. (30 points) Use Theorem 5.5.3 and Example 6.1.1 to convert the following regular expression into an NFA-\(\lambda\). Apply the full steps for converting a regular expression to an NFA-\(\lambda\). Do not simplify the machine by removing \(\lambda\) transitions or making other changes. Do not construct the machine “directly”. For your convenience, it is acceptable to label machines corresponding to segments of the regular expression and use them in subsequent drawings (see class examples).

\[(a \cup b)^* b a^* a b^*\]

2. (15+20 points) Let \(M_1\) be the following NFA:

(a) Give the transition function \(t\) for \(M_1\) in tabular form.

(b) Use algorithm 5.6.3 to construct a state diagram of a DFA that is equivalent to \(M_1\). Give the transition function and draw the state diagram of the equivalent DFA.

3. (15+20 points) Let \(M_2\) be the following NFA-\(\lambda\):

(a) Give the transition function \(t\) for \(M_2\) in tabular form. Include a column for the \(\lambda\)-closure of each state.

(b) Use algorithm 5.6.3 to construct a state diagram of a DFA that is equivalent to \(M_2\). Give the transition function and draw the state diagram of the equivalent DFA.