1. Construct a deterministic finite automaton (DFA) that recognizes the following language over the alphabet \{a, b\}:

\[ \{ w \mid \text{w is any string not in } (a \cup ab)^* b^* \} \]

Construct an NFA for \((a \cup ab)^* b^*\). Convert it to a DFA using the subset construction algorithm and then take the complement by switching accepting and nonaccepting states.

NFA for \((a \cup ab)^* b^*\):

DFA for \((a \cup ab)^* b^*\):

see next page
2. Construct a deterministic finite automaton (DFA) that recognizes the language \(a^*b^* \setminus (a \cup ab)^*\). The alphabet is \(\{a, b\}\).

Construct DFAs for \(a^*b^*\) and \((a \cup ab)^*\). Then apply the ‘product construction’ method.

3. Consider the following NFA. The set of states, \(Q\), is \(\{1, 2, 3\}\). The initial state is 1 and the accepting state is 2. The alphabet is \(\{a, b\}\).

Convert this NFA to a DFA. Show work clearly.