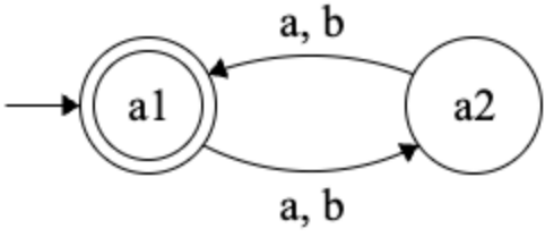
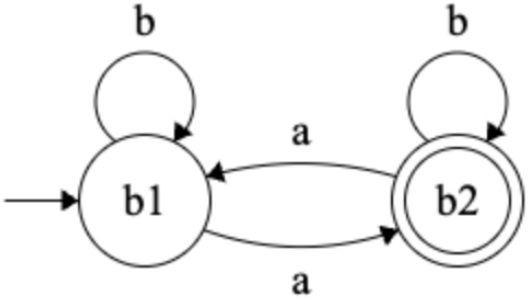
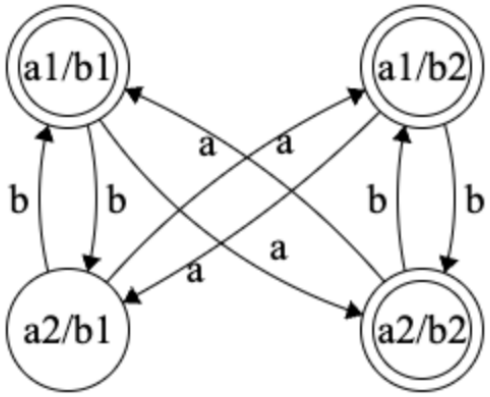
Chapter 1.2 Practice Key

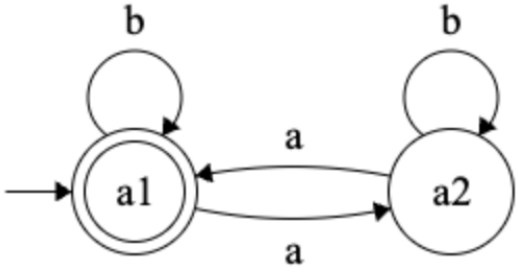
1. Each language below is the union of two simpler languages. In each part, construct DFAs for the simpler languages, then combine them using the construction we saw for union. (Note that Σ = {a, b}.)
    a. {w | w has even length} OR {w | w has an odd number of a's}

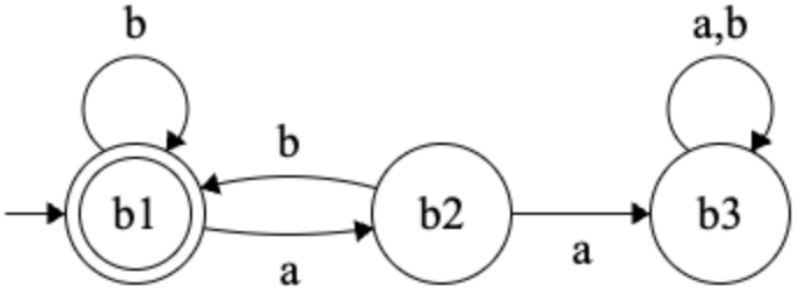


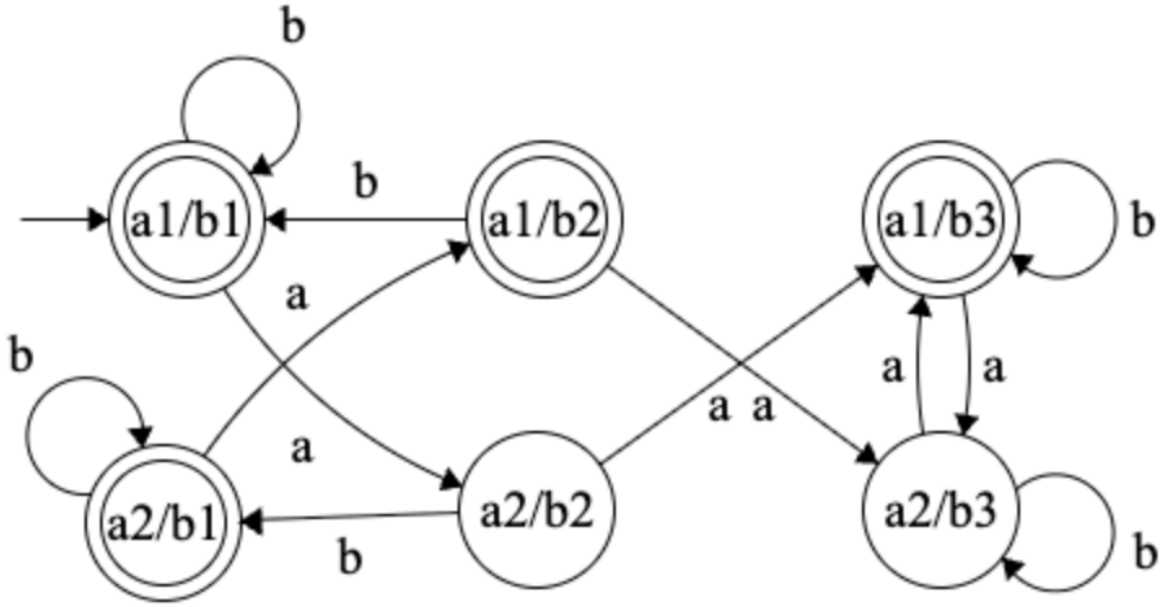




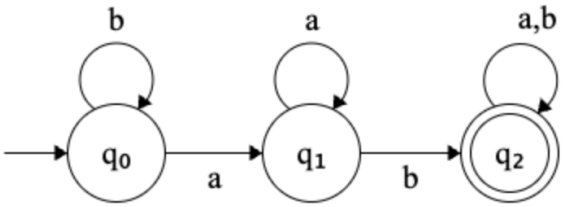
b. {w | w has an even number of a's} OR {w | each a in w is followed immediately by at least one b}



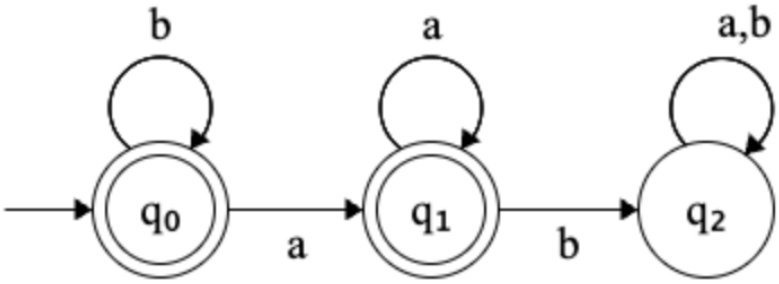




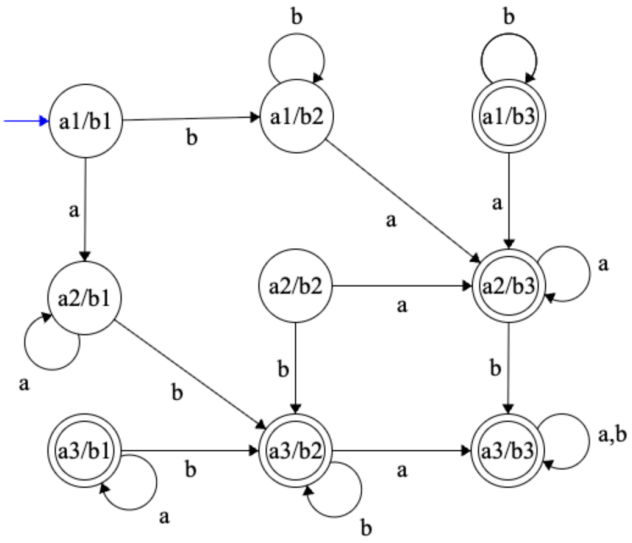
2. For the homework, you will show that if M is a DFA accepting B, then swapping the accept and non-accept states gives a DFA accepting $\bar{B}$. Use this fact to construct DFAs accepting the following languages.
    a. {w | w does not contain the substring ab}



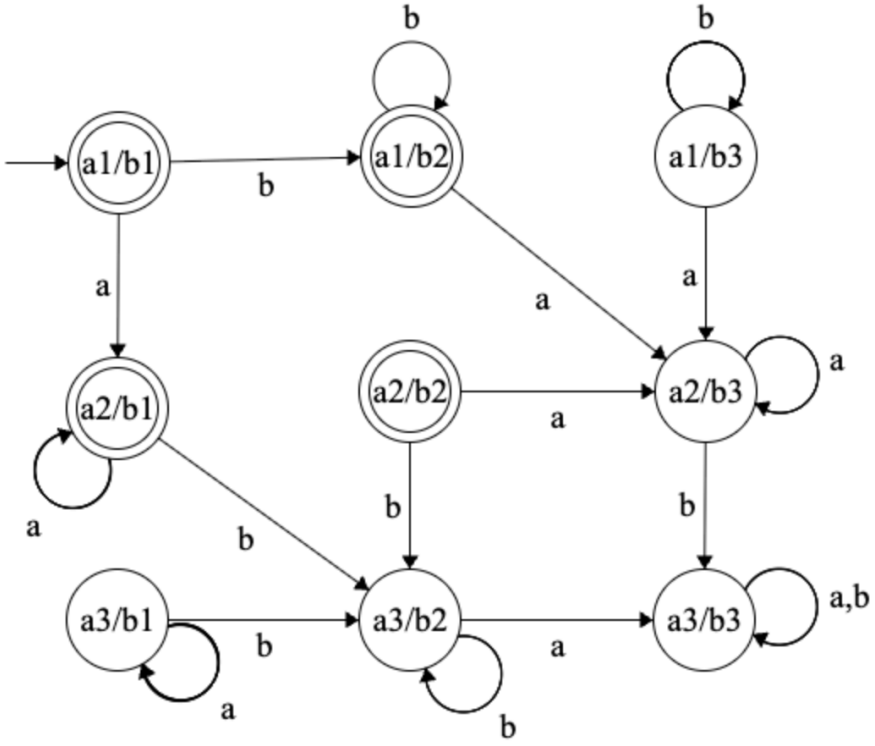
Contains the substring ab



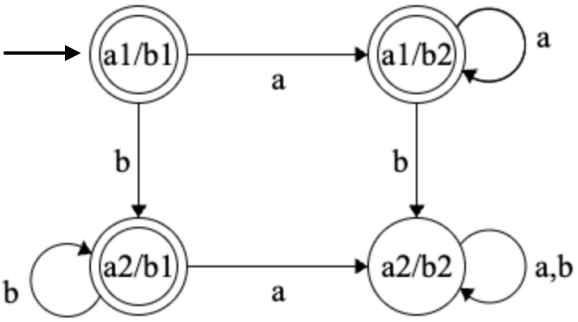
b. {w | w contains neither the substrings ab nor ba}



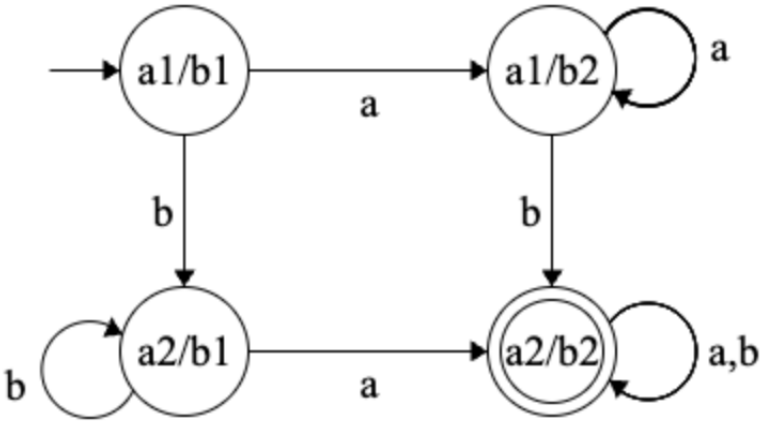
Contains the substrings ab or ba



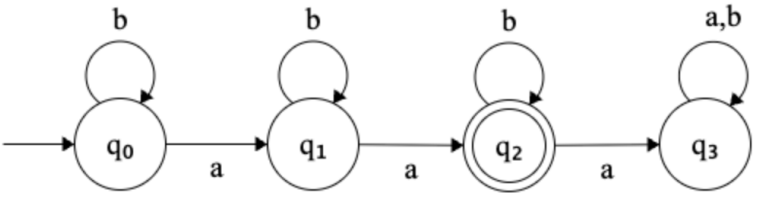
c. {w | w is not in $a^* \cup b^*$}



Union of a* and b*



d. {w | w doesn't contain exactly two a's}



Contains exactly two a's