1. For each of the problems below, give a regular expression which only accepts the following. Assume $\Sigma = \{a\ b\}$

   (a) All strings that begin and end with the same letter
   (b) All strings in which the total number of $a$’s is divisible by 3
   (c) All strings that end in a double letter

2. Show the following pairs of regular expressions define the same language

   (a) $(ab)^*a$ and $a(ba)^*$
   (b) $(a^*bb)^*a^*$ and $a^*(bba^*)^*$

3. Describe (in English phrases) the languages associated with the following regular expressions

   (a) $(a+b)^*a(\lambda + bbb)$
   (b) $(a(aa)^*b(bb)^*)^*$
   (c) $((a + b)a)^*$

4. Build an FA that accepts only the language of all words with $b$ as the second letter. Show both the picture and the transition table for this machine and find a regular expression for the language.

5. Find two FA’s that satisfy these conditions: Between them they accept all words in $(a + b)^*$, but there is no word accepted by both machines.

6. Describe the languages accepted by the following FA’s:

   (a)

   ![Diagram](a)

   (b)

   ![Diagram](b)

   (c)

   ![Diagram](c)