

### Exercise 3.7.

Find a regular expression corresponding to each of the following subsets of  $\{a, b\}^*$ .

- a. The language of all strings containing exactly two  $a$ 's.
- c. The language of all strings that do not end with  $ab$ .
- e. The language of all strings not containing the substring  $aa$ .
- f. The language of all strings in which the number of  $a$ 's is even.
- g. The language of all strings containing no more than one occurrence of the string  $aa$ . (The string  $aaa$  should be viewed as containing two occurrences of  $aa$ .)

### Exercise 3.7.

Find a regular expression corresponding to each of the following subsets of  $\{a, b\}^*$ .

**i.** The language of all strings containing both  $bb$  and  $aba$  as substrings.

**j.** The language of all strings not containing the substring  $aaa$ .

**k.** The language of all strings not containing the substring  $bba$ .

**l.** The language of all strings containing both  $aba$  and  $bab$  as substrings.

**m.** The language of all strings in which the number of  $a$ 's is even and the number of  $b$ 's is odd.

**Exercise 3.1.** In each case below, find a string of minimum length in  $\{a, b\}^*$  **not** in the language corresponding to the given regular expression.

**a.**  $b^*(ab)^*a^*$

**b.**  $(a^* + b^*)(a^* + b^*)(a^* + b^*)$

**Exercise 3.2.** Consider the two regular expressions

$$r = a^* + b^* \quad s = ab^* + ba^* + b^*a + (a^*b)^*$$

- a.** Find a string corresponding to  $r$  but not to  $s$ .
- b.** Find a string corresponding to  $s$  but not to  $r$ .
- c.** Find a string corresponding to both  $r$  and  $s$ .
- d.** Find a string in  $\{a, b\}^*$  corresponding to neither  $r$  nor  $s$ .

### Exercise 3.10.

a. If  $L$  is the language corresponding to the regular expression  $(aab + bbaba)^*baba$ , find a regular expression corresponding to  $L^r = \{x^r \mid x \in L\}$ .

b.

c.

## Exercise 3.41.

e.

**Exercise 3.42.**

## Exercise 3.51.

a.