1. Exercises 1.10, 1.14(b), 1.16(b) [Sipser’s book]
2. Problems 1.24, 1.32 [Sipser’s book]
3. Let $L$ be a language over the alphabet $\Sigma$. We write $\text{pref}(L)$ for the language of the prefixes of the words in $L$; that is,

$$\text{pref}(L) = \{s : \text{there is } t \in \Sigma^* \text{ for which } st \in L\}. \quad (1)$$

Similarly, $\text{suff}(L)$ and $\text{seg}(L)$ denote the languages of the suffixes and segments of the words in $L$:

$$\text{suff}(L) = \{t : \text{there is } s \in \Sigma^* \text{ for which } st \in L\}. \quad (2)$$

$$\text{seg}(L) = \{t : \text{there are } s \text{ and } u \in \Sigma^* \text{ for which } stu \in L\}. \quad (3)$$

(i) Show that $\text{suff}(L) = \text{pref}(L^R)^R$ and $\text{seg}(L) = \text{suff}(\text{pref}(L))$. (Here $A^R$ is as defined in Exercise 1.24 in Sipser’s book).

(ii) Show that if $L$ is regular, then so is $\text{pref}(L)$. You can do this considering either regular expressions or finite automata.

(iii) Show that if $L$ is regular, then so are $\text{suff}(L)$ and $\text{seg}(L)$.