Section 3.3

(3) Right Linear

- \( S \to aaA \)
- \( A \to aA | bbbB \)
- \( B \to bB | \lambda \)

Left Linear

- \( S \to Abbb \)
- \( A \to Ab | Baa \)
- \( B \to Ba | \lambda \)

(5) \( S \to bS | \lambda | aA \)

(9) \( S \to A | B \)

- \( A \to aaA | C \)
- \( B \to aaB | abC \)
- \( C \to bbC | \lambda \)

Extra problem 1. Using the right-linear grammar given in exercise 1 of section 3.3.

\[ S \to a \]
\[ A \to b \]
\[ B \to c \]

Extra problem 2. Sorry, I meant Figure 2.6 on page 46, not page 47.
( Let \( S \sim q_0, A \sim q_1, B \sim q_2, C \sim q_3. \) )

- \( S \to bA | aB \)
- \( A \to aA | bA \)
- \( B \to bB | aC \)
- \( C \to aC | bB | \lambda \)

Extra problem 3. Let \( G_1 \) be the following left-linear grammar:

- \( S \to Sabb | Abaa | \lambda \)
- \( A \to Aba | a \)

(a) A right linear grammar \( G_2 \) such that \( L(G_2) = L(G_1)^R \).

- \( S \to bbaS | aabA | \lambda \)
- \( A \to abA | a \)
(b) An nfa $M$ such that $L(M) = L(G_2)$.

(c) An nfa $N$ such that $L(N) = L(M)^R$.

(e) A right-linear grammar $G$ such that $L(G) = L(N) = L(G_1)$.

\[
S \rightarrow aA | B \\
A \rightarrow baA | baaB \\
B \rightarrow abbB | \lambda
\]