(Last) Homework 5, due Monday, October 9

READING: Chapters 7, 8, 14, 15, 16.

1. Exercise 17.b. on page 249. (20 points)

2. Let $M$ be the Turing machine defined by

\[
\begin{array}{c|cccc}
\delta & B & a & b & c \\
q_0 & (q_0, B, R) & (q_0, a, R) & (q_0, b, R) & (q_1, c, L) \\
q_1 & (q_2, B, R) & (q_1, b, L) & (q_1, a, L) & - \\
q_2 & - & - & - & - \\
\end{array}
\]

(a) Trace the computation for the input string $abcab$.

(b) Trace the first six transitions of the computation for the input string $abab$.

(c) Give the state diagram of $M$ and describe the result of a computation in $M$.

(20 points)

3. Construct a Turing machine with input alphabet \(\{a, b, c\}\) that accepts strings in which the first $c$ is immediately preceded by the substring $aaa$. A string must contain a $c$ to be accepted by the machine. (20 points)

4. Construct a Turing machine with input alphabet \(\{a, b, c\}\) that accepts the language \(L = \{a^i b^i c^i \mid i \geq 0\}\) by halting only. (20 points)

5. Construct a standard Turing machine that accepts the set of palindromes over \(\{a, b\}\). (20 points)