3.1 b)

* $(q_1, \underline{0}0)$
* $(q_2, \sqcup\underline{0})$
* $(q_3, \sqcup \times \underline{\sqcup})$
* $(q_3, \sqcup \underline{\times} \sqcup)$
* $(q_5, \underline{\sqcup} \times \sqcup)$
* $(q_2, \sqcup \underline{\times} \sqcup)$
* $(q_2, \sqcup \times \underline{\sqcup})$
* $(q_{accept}, \sqcup \times \sqcup \underline{\sqcup})$

$\boxed{(q_{accept}, \sqcup \times \sqcup \underline{\sqcup})}$

3.2 b)

1) $(q_1, \underline{1} \# 1)$
2) $(q_3, \times \# \underline{1})$
3) $(q_5, \times \# \underline{1})$
4) $(q_6, \times \underline{\#} \times)$
5) $(q_7, \underline{\times} \# \times)$
6) $(q_1, \times \underline{\#} \times)$
7) $(q_8, \times \# \underline{\times})$
8) $(q_8, \times \# \times\underline{\sqcup})$
a) $(q_{accept}, \times \# \times \sqcup \underline{\sqcup})$

3.2)c) 1) $(a_{11}, \underline{1}\#\#1)$
        2) $(q_3, x \underline{\#} \#1)$
        3) $(q_5, x\# \underline{\#} 1)$
        4) $(q_{reject}, x\#\# \underline{1})$

3.5) a) Yes. The tape Γ contains $\sqcup$. Turing machine
         can write any char on its tape
      b) No, Σ never contains $\sqcup$. But Γ contains
         $\sqcup$.
      c) Yes. If the Turing machine moves its head
         to the left-end it stays in the same cell
      d) No. A Turing machine must have distinct
         states: q_{accept} & q_{reject}

3.8)b)

$x \to x, L$
$1 \to 1, L$
$0 \to 0, L$

$1 \to 1, R$
$x \to x, R$

$1 \to 1, R$
$x \to x, R$

$0 \to 0, R$
$x \to x, R$

$q_0 \longrightarrow q_1$

$q_1 \xrightarrow{1 \to x, L} q_2$

$q_2 \xrightarrow{\# \to \#, R} q_3$

$q_3 \xrightarrow{0 \to x, L} q_4$

$q_4 \xrightarrow{0 \to +} q_5$

$\sqcup \to \sqcup, R$

q_{reject}

$\sqcup \to \sqcup, R$

$0 \to 0, L$
$x \to x, L$

$0 \to 0, R$

q_6

$x \to x, R$

$q_6 \xrightarrow{\# \to \#, L} q_7$

$q_7 \xrightarrow{\sqcup \to \sqcup, R} q_{accept}$

$0 \to 0, L$
$1 \to 1, L$
$x \to x, L$
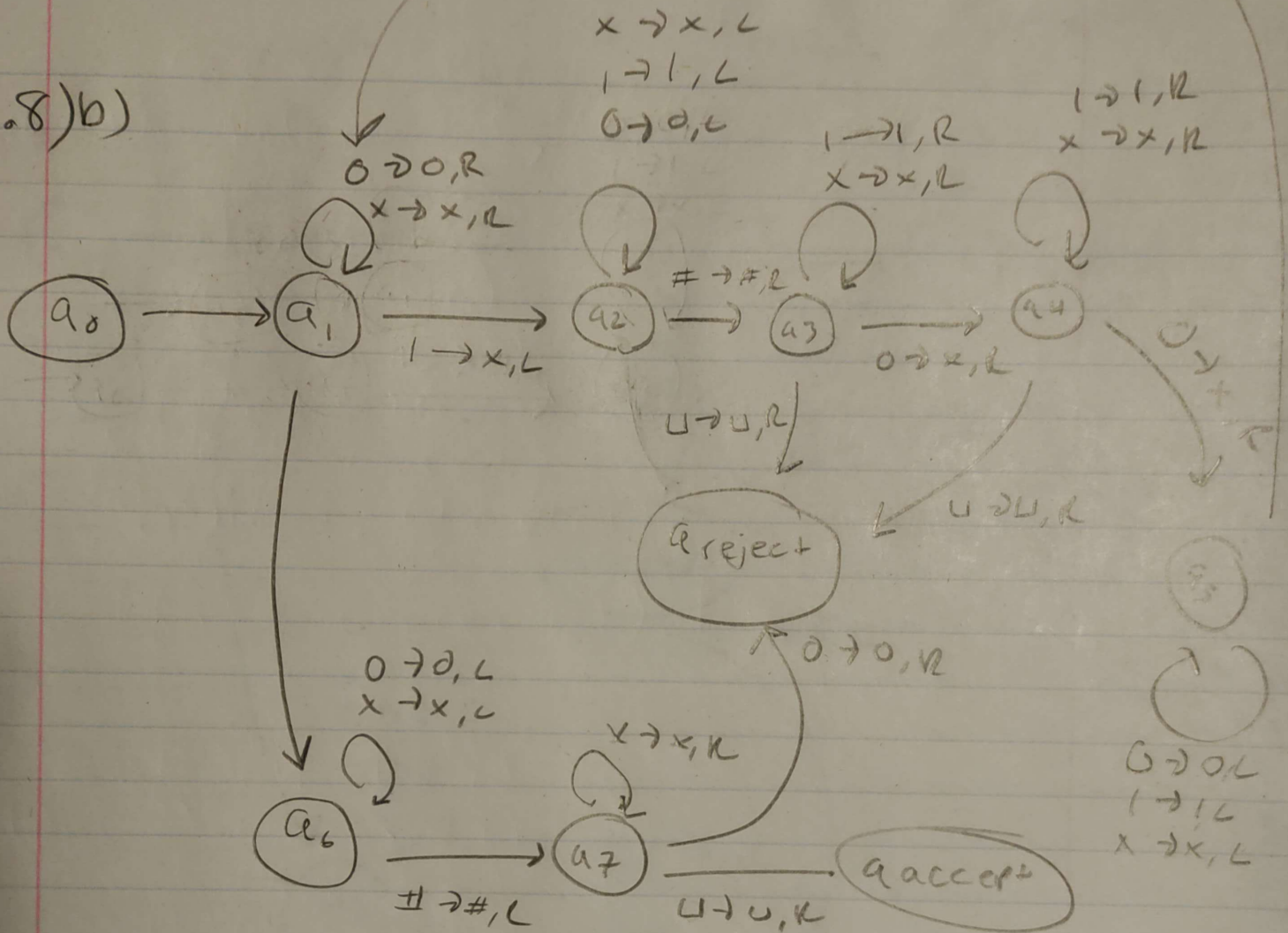
Flip accept and reject states?

3.8)

c)

$x \to x, R$
$0 \to 0, R$

$x \to x, L$
$1 \to 1, L$
$0 \to 0, L$

$1 \to 1, R$
$x \to x, R$

$x \to x, R$
$1 \to 1, R$

$q_0 \to q_1$

$1 \to x, L$

$q_2 \xrightarrow{\# \to \#, R} q_3$

$0 \to x, R$

$q_3 \to q_4$

$0 \to x, R$

$\sqcup \to \sqcup, R$

$\sqcup \to \sqcup, R$

q_{accept}

$0 \to 0, L$

$x \to x, L$
$0 \to 0, L$

$0 \to 0, L$
$1 \to 1, L$
$x \to x, L$

q_5

q_6

$x \to x, R$

$q_6 \xrightarrow{\# \to \#, R} q_7$

$q_7 \to q_{reject}$