Problem Set 3

The problems listed here are from the 3rd edition of the Sipser book, standard version (i.e., not the problematic international version that I had). You can look at your copy and do the problems as they appear in there.

- Chapter 3 pp. 187–190: Exercises and Problems 3.1, 3.2, 3.5, 3.6, 3.8, 3.11, 3.15, 3.16 (a–d), 3.18, 3.22
- Consider the following Turing machine:

$$M = (\{q_0, q_1, q_2, q_3, q_a, q_r\}, \{0,1\}, \{0,1,X,Y,\textvisiblespace\}, \delta, q_0, q_a, q_r)$$

where δ is defined as shown in the table. Below, any entry marked by '–' means that M transitions to q_r on the input, writes the input on the tape, then moves right one position.

State	0	1	X	Y	␣
q_0	(q_1, X, R)	–	–	(q_3, Y, R)	–
q_1	$(q_1, 0, R)$	(q_2, Y, L)	–	(q_1, Y, R)	–
q_2	$(q_2, 0, L)$	–	(q_0, X, R)	(q_2, Y, L)	–
q_3	–	–	–	(q_3, Y, R)	$(q_4, \textvisiblespace, R)$
q_a	–	–	–	–	–
q_r	–	–	–	–	–

1. Draw the transition diagram for M. Be neat. You should omit q_r and all transitions to it to keep the diagram readable.
2. List all configurations, in order, for the execution of M on input 0011.
3. Does M accept 0011?
4. Describe the language recognized by M. Justify your answer.