Theory of Computation

Homework 1

Due: 2013/10/01

Problem 1 Please describe the workings of the following two Turing machines:

a. Let M be the Turing machine $M = (K, \Sigma, \delta, s)$, where $K = \{s, h\}$

$p \in K$	$\sigma \in \Sigma$	$\delta(p, \sigma)$
s	$\triangleright$	$(s, \triangleright, \rightarrow)$
s	1	$(s, 0, \rightarrow)$
s	0	$(s, 1, \rightarrow)$
s	$\sqcup$	$(h, \sqcup, -)$

b. Let M be the Turing machine $M = (K, \Sigma, \delta, s)$, where $K = \{s_0, s_1, h\}$

$p \in K$	$\sigma \in \Sigma$	$\delta(p, \sigma)$
s_0	$\triangleright$	$(s_0, \triangleright, \rightarrow)$
s_0	1	$(s_1, 1, \rightarrow)$
s_0	0	$(s_0, 0, \rightarrow)$
s_1	0	$(s_0, 0, \rightarrow)$
s_1	1	$(h, 1, -)$
s_0	$\sqcup$	$(h, \sqcup, -)$
s_1	$\sqcup$	$(h, \sqcup, -)$

Problem 2 Show that if a language is recursively enumerable, then there is a Turing machine that enumerates it (i.e., to output its members) without ever repeating an element of the language. Recall that in the original definition of enumeration on p. 41 of the slides, we do not require that every member is printed only once.