COMP-170: Homework #2

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Problem 1

Write a Turing machine (high level pseudo-code) to decide the following language:

$$L = \{x\#y \mid x, y \in \{0,1\}^* \text{ and } |x| < |y|\}$$

* * *

M on input s

1. If the first cell of s is B, *REJECT* // Reject the empty string
2. If the first cell of s is #, walk right one cell:
   (a) If cell is B or #, *REJECT* // This means $|x| = |y| = 0$
   (b) If cell is 0 or 1, *ACCEPT* // This means $|x| = 0, |y| > 0$
3. Repeat loop:
   (a) Mark current cell with $\#L$
   (b) Walk right until we hit # or B
      i. If on B, *REJECT* // Couldn't find #
   (c) Walk right until we hit first 0, 1, #, or B
      i. If on # or B, *REJECT* // Mismatched $\#L$ and $\#R$, $|x| > |y|$, or bad format
   (d) Mark current cell with $\#R$
   (e) Walk left until we hit #
   (f) Walk left one cell
      i. If on $\#L$, go to step 4 // Done marking all $\#L$
   (g) Walk left until we hit first $\#L$
   (h) Walk right one cell
4. Walk right until we hit first 0, 1, or B
   (a) If on 0 or 1, *ACCEPT* // Unmarked cell(s) of y still remain, $|x| < |y|$
   (b) If on B, *REJECT* // Marked all cells of y already