

Homework #12

Question 1. Please make a Turing machine with the alphabet $\{0, 1\}$ which computes the bitwise OR of two strings given as stacked inputs.

Question 2. Please make a Turing machine which converts separated strings to a stacked string on the alphabet $\{0, 1\}$ with separator symbol $\#$. For example, your TM might start with something like 0010#0101 on the tape, and it would end with $\begin{smallmatrix} 0 & 0 & 1 & 0 \\ 0 & 1 & 0 & 1 \end{smallmatrix}$. You may assume that the two separated strings have the same length and are not empty.

Question 3. Please make a Turing machine which converts a stacked string to separated strings on the alphabet $\{0, 1\}$ with separator symbol $\#$.

Question 4. Please explain (in ordinary words- doesn't need to be a real proof) how you could use the TMs above, together with what we did in class, to make a TM which adds two binary numbers which are given as separated strings.

Question 5. Please give a TM on the alphabet $\{a, b\}$ which computes the function $f(x, y) = yx$, where the input is given with separator symbol $\#$. (So the input looks like $x\#y$.)

Question 6. Please give a TM on the alphabet $\{a, b\}$ which computes the following function: the input has the form $c\#x$ where c is a single letter (either a or b) and $x \in \{a, b\}^*$ is a string, and the output is $c^{|x|}$.