CS305 Tutorial - 10

1). Design Turing machines to compute the functions for x and y positive integers represented in unary.

a) $f(x) = 3x$

b) $f(x,y) = 2x + 3y$

c) $f(x) = x \bmod 5$

d) $f(x) = \begin{cases} \frac{x}{2}, & \text{if } x \text{ is even} \\ \frac{x+1}{2}, & \text{if } x \text{ is odd.} \end{cases}$

2). Design a Turing machine to accept the language $L = \{ww : w \in \{a,b\}^+\}$.

3). Design a Turing machine that finds the middle of a string of even length. Specifically, if $w = a_1 a_2 \ldots a_n a_{n+1} \ldots a_{2n}$ with $a_i \in \Sigma$, the Turing machine should produce

$\hat{w} = a_1 a_2 \ldots a_n \, c \, a_{n+1} \ldots a_{2n}$,

where $c \in \Gamma - \Sigma$.

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