QUANTUM ALGORITHMS
HOMEWORK 1 ADDITIONAL PROBLEMS

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1. Write a Turing machine that takes as input a binary number a (a string in "0" and "1") and outputs $a - 1$ (in binary). Be careful to specify the alphabet and all instructions.

2. Let $\mathcal{T} = \{\mathcal{M} \mid \mathcal{M} \text{ is a Turing machine}\}$.

Find a function $f : \mathcal{T} \to \mathbb{N}$ such that if $\mathcal{N}$ and $\mathcal{M}$ are Turing machines and $f(\mathcal{N}) = f(\mathcal{M})$ then $\mathcal{N} = \mathcal{M}$ (that is, $\mathcal{N}$ and $\mathcal{M}$ have the same alphabet, same transition function, etc.).