Math 160B - Winter 2022 - Homework 5
Due Monday, February 7, 11:00am
(Hand in by uploading to Gradescope)

Recall that w^{R} is the reversal of w, namely w written backwards.

Give your answers by completely describing a Turing machine, preferably with a state diagram. Use the input alphabet $\Sigma = \{0, 1\}$. You may use any tape alphabet Γ you wish.

(The problems are not in order of difficulty.)

1. Prove that the function $w \mapsto w^{\mathrm{R}}$ is Turing computable. (Hint: You may change w to w^{R} in place, but it is not necessary to do this.)

2. Prove that the set $\{w \in \Sigma^* : w = w^{\mathrm{R}}\}$ is Turing decidable.

3. Prove that the set $\{1^n 0 : n \geq 0\} = \{0, 10, 110, 1110, 11110, \ldots\}$ is Turing decidable.

4. Prove that the set $\{1^n 0 : n \geq 0\} = \{0, 10, 110, 1110, 11110, \ldots\}$ is Turing enumerable by giving a machine that enumerates it.