Week 11

Problem: Good Lemmas make Good Neighbors

We call an input to a given Turing Machine *neighborly* if it causes that Turing Machine to enter at least half of its states. For example, if we had some Turing machine M that had 24 states and the input **011010** caused M to enter 12 distinct states, then we would say that **011010** is a *neighborly* input for M.

Use a proof-by-reduction to show that the function *IsNeighborly* defined below is uncomputable.

Input: A string m that describes a Turing Machine and a string w that will serve as an input for that Turing Machine.

Output: **1** if w is a *neighborly* input for the Turing Machine described by m; otherwise **0**.

(Note: For this problem, we do want to see that you understand how to do a reduction proof, so even if you can prove it using some other method, you should nonetheless provide a proof using the reduction method.)