Name: YOUR NAME HERE

CS46 lab 8

This homework is due at 11:59pm on Tuesday, March 24. This is a 10-point homework.

You may work with one partner on this lab. Your write-up is your own: do not share it, and do not read other teams' write-ups. If you use any out-of-class references (anything except class notes, the textbook, or asking the instructor), then you **must** cite these in your post-lab survey. Please refer to the course webpage or ask me any questions you have about this policy.

The main **learning goal** of this homework is to work with and think about Turing machines and decidability. You should feel free as always to cite and use techniques and theorems from class or the textbook.

1. Prove that the following language is decidable:

$$\{\langle M \rangle \mid M \text{ is a DFA and } \forall w, \text{ if } w \in L(M) \text{ then } w^R \in L(M)\}$$

2. Show that ALL_{DFA} is decidable, where ALL_{DFA} is defined as:

$$ALL_{DFA} = \{\langle A \rangle \mid A \text{ is a DFA and } L(A) = \Sigma^*\}$$

   (Hint: you may want to refer to the textbook for some other decidable languages related to DFAs, and recall back when we proved things like "regular languages are closed under intersection". I suggest you also look at the textbook solution for showing that $INFINITE_{DFA}$ is decidable (Sipser 4.10))

3. Show that every infinite Turing-recognizable language L has an infinite decidable subset. (Hint: consider an enumerator for L.)