Introduction to Theoretical Computer Science, Fall 2024
Assignment 6 (Due October 28 Monday 4:00 pm)

Only part I will be graded.

1 Part I

Q1. Are the following statements true or false? Briefly explain your answer.

(a) Every standard Turing machine semidecides exactly one language.

(b) Every standard Turing machine decides exactly one language.

Q2. Let L be a recursive language. Prove that $\overline{L}$ is also recursive.

2 Part II

Q3. Let D be a DFA. Consider the following decision problem.

Given a string w, does D accept w?

(a) What is the language corresponding to the following problem?

(b) Is this language recursive?

(c) Prove that every regular language is recursive.

Q4. Let $L = \{w \in \{0,1\}^* : w \text{ contains an odd number of 1's}\}$. Define

$$A_L = \{\text{“}D\text{”} : D \text{ is a DFA that accepts } L\}.$$

Show that A_L is recursive. (Hint: you may reduce A_L to EQ_{DFA}.)