# CS 3530: Assignment 4a

Fall 2023

## Exercise 4.2 (10 points)

### Problem

Consider the problem of determining whether a DFA and a regular expression are equivalent. Express this problem as a language and show that it is decidable.

### Solution

L = ⟨R,S⟩

L(R) = L(S)

R is a DFA and S is a RE. Convert S to a DFA

Run TM as decider F using Theorem 4.5 on input R and S.

If F accepts, accept. If F rejects, reject

## Exercise 4.3 (10 points)

### Problem

Let $ALL_{\text{DFA}} = \{\langle A \rangle | A \text{ is a DFA and } L(A) = \Sigma^*\}$. Show that $ALL_{\text{DFA}}$ is decidable.

### Solution

A is a DFA that accepts any possible combinations on its input string, and such only has one state.

Mark the initial state, and repeat until no additional states are marked. States having any incoming transitions will be marked.

Accept when all states are marked, else reject