

**CS580 Homework 10****November 8 before the class, 2023**

Determine whether each of the following languages is decidable (recursive). If the language is decidable, informally describe an algorithm to decide it. If the language is undecidable, prove it is undecidable using Rice's Theorem.

1.  $L = \{\langle M \rangle \mid M \text{ accepts } \Sigma^*\}$
2.  $L = \{\langle M \rangle \mid L(M) \text{ is recognized by a Turing machine with an odd number of states}\}$
3.  $L = \{\langle M \rangle \mid M \text{ accepts more than 15 strings}\}$
4.  $L = \{\langle M \rangle \mid M \text{ accepts more than 15 strings of length less than 15}\}$
5.  $L = \{\langle M, w \rangle \mid M \text{ moves past its 10th tape cell on } w\}$
6.  $L = \{\langle M \rangle \mid M \text{ accepts the same strings as some DFA}\}$
7.  $L = \{\langle M \rangle \mid L(M) \text{ can be generated by a grammar in Chomsky normal form}\}$
8.  $L = \{\langle M \rangle \mid M \text{ contains an unreachable state (a state never visited on any input)}\}$
9.  $L = \{\langle M \rangle \mid L(M) \text{ is not recursively enumerable}\}$
10.  $L = \{\langle M \rangle \mid M \text{ accepts the same strings as some TM that always halts}\}$