

Practice Midterm 1

1. State whether each of the following statements is true. In addition, give a short proof (2-3 lines are sufficient) if the statement is true, and give a counterexample otherwise.
 - (a) There are infinitely many regular languages.
 - (b) If L_1, L_2, \dots, L_{172} are all regular languages, then the language $\bigcap_{i=1}^{172} L_i$ is regular.
 - (c) If L_1, L_2, L_3, \dots is an infinite sequence of regular languages, then the language $\bigcap_{i=1}^{\infty} L_i$ is regular.

2. Consider the language
$$A_{\text{DFAinf}} = \{D \mid D \text{ is a DFA that recognizes a language containing infinitely many strings}\}$$
Prove that A_{DFAinf} is decidable.

3. Show that any infinite, Turing-recognizable (recursively enumerable) language contains an infinite, decidable language.