

CSE 431 Spring 2015

Assignment #2

Due: Friday, April 17, 2015

Reading assignment: Read Chapter 4 of Sipser's text.

Problems:

1. Show that the decidable languages are closed under the concatenation, intersection, and star operations.
2. Show that the Turing-recognizable languages are closed under the concatenation, intersection, and star operations.
3. Let $ALL_{DFA} = \{\langle M \rangle \mid M \text{ is a DFA with alphabet } \Sigma \text{ and } L(M) = \Sigma^*\}$. Prove that ALL_{DFA} is decidable.
4. Prove that a language is decidable if and only if there is an enumerator that enumerates it in lexicographic order. (Hint: Handle the case where the language is finite separately from the case when it is infinite.)
5. Use the result of question 4 to show that any infinite Turing-recognizable language contains an infinite decidable subset.
6. (Bonus) Let C be a language. Prove that C is Turing-recognizable iff there is a decidable language D such that $C = \{x \mid \exists y \text{ such that } \langle x, y \rangle \in D\}$.