CpSc 3500 — Goddard — Fall24

Assignment 9

(Please work in groups of two or three and submit one answer sheet for the group.)

1. Give short justifications of these facts about $\leq_m$. For any language B:
   (a) If B is r.e. and $B \leq_m \overline{B}$, then B is recursive.
   (b) If B is recursive, then $B \leq_m \mathtt{a}^*\mathtt{b}^*$.

2. For the ***implication-satisfaction problem***, the input is a list of implications, each involving two boolean variables, some of which are negated. An implication $a \to b$ means that if a is TRUE then b is TRUE. Similarly, the implication NOT $a \to b$ means that if a is FALSE then b is TRUE. The goal is to determine if there is an assignment of each variable to true or false that satisfies every implication. Show that the implication-satisfaction problem can be solved in polynomial time.

For questions 3–5, use of the Internet is allowed

3. True/False/Unknown: The language of binary palindromes is NP-complete.

4. According to the Wikipedia article on NP-completeness, which of the following is NP-complete?
   (a) Traveling salesman problem
   (b) Knapsack problem
   (c) Subgraph isomorphism problem
   (d) All of the above

5. According to the Wikipedia article on NP-completeness, which one of the following is true?
   (a) It is not known whether the set of NP-complete problems is closed under complementation
   (b) NP-complete problems are the most difficult known problems
   (c) Solving NP-complete problems requires exponential time
   (d) Each instance of an NP-complete problem is difficult

Due: Noon Tuesday December 3