CSCI 570 - HW 11
Due: April 20th

Graded Problems

1. State True/False.

   (a) Assume $P \notin NP$. Let A and B be decision problems. If $A \in NPC$ and $A \leq_p B$, then $B \in P$.

   (b) If someone proves **P=NP**, then it would imply that every decision problem can be solved in polynomial time.

   (c) If $A \leq_p B$ and $B \in$ **NP**, then $A \in$ **NP**.

2. Given an n bit positive integer, the problem is to decide if it is composite. Here the problem size is n. Is this decision problem in **NP**?

3. State True/False. Assume you have an algorithm that given a 3-SAT instance, decides in polynomial time if it has a satisfying assignment. Then you can build a polynomial time algorithm that finds a satisfying assignment(if it exists) to a given 3-SAT instance.

4. Show that vertex cover remains **NP**-Complete even if the instances are restricted to graphs with only even degree vertices.

Practice Problems

5. Given an integer $m \times n$ matrix A and an integer $m - vectorb$, the **0-1integer programming problem** asks whether there exists an integer $n - vectorx$ with elements in the set $\{0; 1\}$ such that $Ax = b$. Prove that 0-1integer programming is NP Complete. (*Hint*: Reduce from 3-CNF-SAT.)

6. Assume that you are given a polynomial time algorithm that decides if a directed graph contains a Hamiltonian cycle. Describe a polynomial time algorithm that given a directed graph that contains a Hamiltonian cycle, lists a sequence of vertices (in order) that forms a Hamiltonian cycle.