CSCI 570 - Fall 2019 - HW 11

1 Practice Problems

1. State True/False. Let A be *NP-complete*, and B be *NP-hard*. Then, $A \leq_p B$.

2. State True/False. If $P = NP$, then every NP-hard problem can be solved in polynomial time.

3. Given an undirected graph $G = (V, E)$, a clique is a subset $A \subseteq V$ such that For every pair of vertices $u, v \in A$, if $u = v$, then $(u, v) \in E$. Given a graph and an integer m, the *CLIQUE* problem is to decide if the graph has a clique of size m. The *HALF-CLIQUE* problem is to decide if a given graph $G = (V, E)$ has a clique of size at least $\frac{|V|}{2}$.

   First, show that *CLIQUE* is *NP-complete* by showing a reduction from the *INDEPENDENT-SET* problem which is known to be *NP-complete*. Further, show that *HALF-CLIQUE* is *NP-complete* by showing a reduction from *CLIQUE*.

4. Given an undirected graph with positive edge weights, the *BIG-HAM-CYCLE* problem is to decide if it contains a Hamiltonian cycle C such that the sum of weights of edges in C is at least half of the total sum of weights of edges in the graph. Show that *BIG-HAM-CYCLE* is *NP-complete*. You are allowed to use the fact that deciding if an undirected graph has a Hamiltonian cycle is *NP-complete*.