

CS3230

Tutorial 11

1. Show that the question of determining whether a graph $G = (V, E)$ has a simple cycle of size at least k is NP-complete.

2. Consider the following problem called vertex cover.

Input: An undirected graph $G = (V, E)$, and a number k .

Question: Does there exist a vertex cover of size k ? That is, does there exist $V' \subseteq V$, $|V'| \leq k$ such that, for each edge $(u, v) \in E$, at least one of u, v is in V' .

Show that the above problem is NP complete.

3. 3-Colorability

Input: An undirected graph $G = (V, E)$.

Question: Is there a mapping $color : V \rightarrow \{1, 2, 3\}$ such that for all $(v, w) \in E$, $color(v) \neq color(w)$?

Show that the above problem is NP-complete.

4. Not-All-Equal SAT (NAESAT).

Input: A set of variables V , and a set C of clauses (you may assume each clause has exactly three literals).

Question: Is there a truth assignment to the variables so that each clause has at least one true literal and at least one false literal?

Show that the above problem is NP complete.