

CSE 6321 - Problem Set 6

Due beginning of lecture on March 21st

Problem numbers are from the third edition of Sipser's book. If unsure about which problem to solve, ask. Collaboration is permitted; looking for solutions from external sources (books, the web, material from previous years, etc.) is prohibited.

1. An undirected graph is *bipartite* if its nodes may be divided into two sets so that all edges go from a node in one set to a node in the other set. Show that a graph is bipartite if and only if it doesn't contain a cycle that has an odd number of nodes. Let $BIPARTITE = \{\langle G \rangle : G \text{ is a bipartite graph}\}$. Show that $BIPARTITE \in NL$.
2. Recall that a directed graph is *strongly connected* if every two nodes are connected by a directed path in each direction. Let

$$STRONGLY-CONNECTED = \{\langle G \rangle : G \text{ is a strongly connected graph}\}.$$

Show that $STRONGLY-CONNECTED$ is NL-complete.

3. Prove that $NTIME(n) \subsetneq PSPACE$.