

CS 521: Data Structures and Algorithms 1

Fall 2011-2012 (Homework 5)

1. (10 Pts.) Show that if $\text{HAM-CYCLE} \in P$, then the problem of listing the vertices of a hamiltonian cycle, in order, is polynomial-time solvable.
2. (10 Pts.) A *hamiltonian path* in a graph is a simple path that visits every vertex exactly once. Show that the language $\text{HAM-PATH} = \{\langle G, u, v \rangle : \text{there is a hamiltonian path from } u \text{ to } v \text{ in graph } G\}$ belongs to NP.
3. (10 Pts.) Show that the \leq_P relation is a transitive relation on languages. That is, show that if $L_1 \leq_P L_2$ and $L_2 \leq_P L_3$, then $L_1 \leq_P L_3$.
4. (10 Pts.) The subgraph-isomorphism problem takes two undirected graphs G_1 and G_2 , and it asks whether G_1 is isomorphic to a subgraph of G_2 . Show that the subgraph-isomorphism problem is NP-complete.
5. (10 Pts.) Problem 34-2 parts **b** and **d** on page 1102 of CLRS book (3rd edition).