

Algorithms
Computer Science 140 & Mathematics 168
Spring 2012
Homework 10a
Due Thursday, March 29

Please download and read the document “How to Write a Proof of NP-completeness” from the course homework webpage. This provides an example of how to write an NP-completeness proof.

1. **[5 Points] Professor Lai and NP!** Professor I. Lai from P.I.T. claims that if P_1 and P_2 are any two problems in NP such that $P_1 \leq_p P_2$, then $P_2 \leq_p P_1$. Prove that this would imply that $P = NP$.
2. **[30 Points] Dominating Set.** The DOMINATING SET problem is stated as follows: Given a graph $G = (V, E)$ and a positive integer ℓ , does there exist a subset S of ℓ vertices in V such that every vertex in V is either in S or is connected by an edge to some vertex in S ?

Take a close look at this problem to make sure that you understand how this problem differs from the seemingly similar VERTEX COVER problem. Prove that DOMINATING SET is NP-complete using a reduction from 3SAT. Write your proof carefully and methodically, using the “How to Write a Proof of NP-completeness” document as an example.