CS 109
Spring 2008
Theory of Computation: Advanced

Homework 4
Due Wed Apr 22, 5:00pm

Prof. Amit Chakrabarti
Computer Science Department
Dartmouth College

General Instructions: Same as in Homework 1.
Honor Principle: Same as in Homework 1.

9. The complexity class DP is defined as follows:

$$\text{DP} \;=\; \{L_1 \cap L_2 \,:\, L_1 \in \text{NP and } L_2 \in \text{coNP}\}\,.$$

   Prove that the language EXACT-IND-SET $= \{\langle G, k\rangle \,:\, G$ is a graph with $\alpha(G) = k\}$ is DP-complete under polynomial time reductions. Here, $\alpha(G)$ is the independence number of G, defined as the size of a maximum independent set of G. [2 points]

10. Locate DP within the polynomial hierarchy, i.e., determine its relation to the classes Σ_i^p and Π_i^p, as best as you can. See if you can say anything more by assuming that the hierarchy does not collapse. [2 points]