

CS 40: Computational Complexity

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October 8, 2025

Collaboration Notice: Talked to Henry Scheible '26 to discuss ideas.

Problem 1. The complexity class DP (which stands for “difference-P”) is defined as follows:

$$\text{DP} = \{A \setminus B : A \in \text{NP and } B \in \text{NP}\}.$$

Prove that the language

$$\text{EXACT-IND-SET} = \{\langle G, k \rangle : G \text{ is a graph with } \alpha(G) = k\}$$

is DP-complete under (deterministic) polynomial-time reductions. Here, $\alpha(G)$ is the independence number of G , defined as the size of a maximum independent set of G .

Solution. We first show that EXACT-IND-SET is in DP and then that it is DP-Complete.