

COMPLEXITY: Exercise No. 6

due next week

1. (Test 2000) Is the following problem **NP**-complete?

Instance: A graph $G = (V, E)$.

Question: Does G contain a clique of size $|V|/2$ *and* a hamiltonian cycle?

2. Show that INDEPENDENT SET remains **NP**-complete even if the input graph has no clique of size 3. (Test 95)
3. Are the following problems **NP**-complete or polynomial? (prove)

EXACTLY ONE SAT:

Instance: A CNF Boolean formula Φ .

Question: Is there an assignments to the variables of Φ such that in each clause of Φ there is *exactly* one TRUE literal ?

MONOTONE 3-SAT:

Instance: A CNF Boolean formula Φ in which each clause is either of the form $(x + y + z)$ or of the form $(\bar{x} + \bar{y} + \bar{z})$.

Question: Is there an assignment that satisfies Φ ?

FEEDBACK VERTEX SET:(Test 92)

Instance: A graph $G = (V, E)$, a positive integer K .

Question: Is there a set $S \subseteq V$ with $|S| \leq K$ such that every cycle in G contains at least one vertex from S ?

THE RURAL POSTMAN PROBLEM: (Test 92)

Instance: A graph $G = (V, E)$, length $l(e) \geq 0$ for each $e \in E$, a set $R \subseteq E$ and a positive integer K .

Question: Is there a (non simple) cycle traversing each arc in R at least once with total length $\leq K$?