

HW8 (due just before the final exam)

1 - Define **SUBGRAPH ISOMORPHISM (SI)** problem as follows : Given two undirected graphs G and H , is G a *subgraph* of H ? (G is a *subgraph* of H if for the set $\{v_1, v_2, \dots, v_n\}$ of *all* nodes of G there are corresponding nodes $\{u_1, u_2, \dots, u_n\}$ of H such that $\{v_j, v_i\}$ is an edge in G iff $\{u_j, u_i\}$ is an edge in H). Prove that **SI** is an **NP-complete** problem.

2 - Define **INTEGER PROGRAMMING (IP)** problem as follows : Given m equations :

$$\sum_{j=1, n} a_{ij} x_j = b_i, \quad i=1, \dots, m$$

in n variables x_j with integer coefficients a_{ij} and b_j , are there solutions with x_j equal to 1 or 0 for each j ? Prove that **IP** is an **NP-complete** problem.

3 – Define **3-COLORING (3C)** problem as follows : Given an undirected graph can its vertices colored with three colors such that no two adjacent nodes have the same color. Prove that 3C is an **NP-complete** problem (*Hint : Use a polynomial reduction to 3SAT*)