

A Polynomial-Time Reduction

3-SAT \propto Clique

Let the Boolean expression B denote an instance of 3-SAT.

Thus $B = C_1 \wedge C_2 \wedge \dots \wedge C_k$, where $C_i = (v_{i1} \vee v_{i2} \vee v_{i3})$ for $1 \leq i \leq k$.

Construct an undirected graph, G , as follows.

$V = \{[i, j] \mid 1 \leq i \leq k \text{ and } 1 \leq j \leq 3\}$.

$E = \{([i, j], [l, m]) \mid i \neq l \text{ and } v_{ij} \neq \overline{v_{lm}}\}$.

Claim: B is satisfiable iff G has a clique of size at least k .