INDEPENDENT-SET =

IND-SET = { "G, k" | There ~~are~~ a size k subset of vertices in G with no edges }

— Ex. show IND-SET $\in$ NP

Let's show that any solution to IND-SET can be applied to CLIQUE problems by converting CLIQUE problems suitably.

Specifically we give a polynomial-time computable function $T: \Sigma^* \to \Sigma^*$ s.t.

$w \in$ CLIQUE iff $T(w) \in$ IND-SET
"G, k" V, Ē, k

— T( ) is a reduction from CLIQUE to IND-SET

So: instead of looking for a clique in G, k, convert to G', k' and look for an IND set.

$T($"G, k"$) = T($"V, E, k"$) =$ "V, Ē, k" achieves above claim
T("G, k")

A language L_1 polynomially reduces to a language L_2, written $L_1 \leq_p L_2$, if there is polynomially computable $T : \Sigma^* \to \Sigma^*$ on strings s.t.

$$\forall w \in \Sigma^* \quad w \in L_1 \text{ iff } T(w) \in L_2$$

immed. consequence: If $L_2 \in P$ then $L_1 \in P$

i.e. L_1 is no harder than L_2 to solve

hence $L_1 \leq_p L_2$

Example: given new language L_2, if you show a T achieving FORMULA_SAT $\leq_p L_2$ then $L_2 \notin P$ ~~???~~ NOT KNOWN TRUE OR P=NP is resolved.

Harder example Show FORMULA_SAT $\leq_p$ CLIQUE,

actually show 3-SAT $\leq_p$ CLIQUE

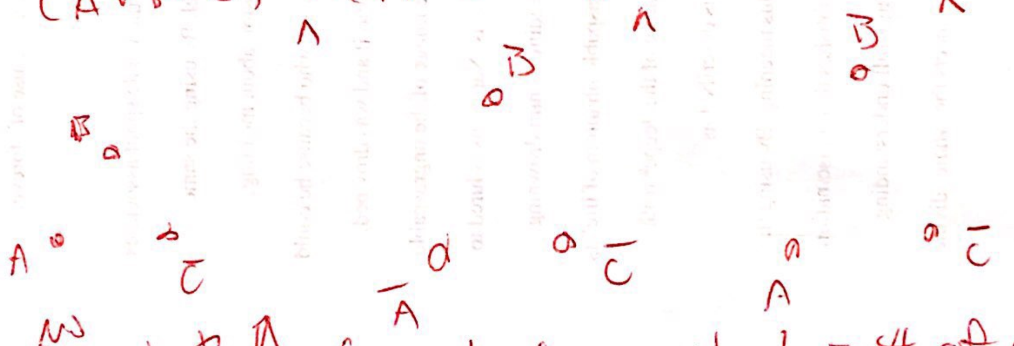
3-SAT = { "φ" | φ is satisfiable and in 3-CNF }

A formula is in 3-CNF (3-conjunctive normal form) iff it is a conjunction (AND) of "3-clauses" (arbitrarily many) $(A \vee \bar{B} \vee C)$

A 3-clause is a disjunction (OR) of exactly 3 literals

A literal is a variable or a negated variable. A $\bar{A}$, B $\bar{B}$

e.g. $(A \vee B \vee \bar{C}) \wedge (\bar{A} \vee B \vee \bar{C}) \wedge (A \vee B \vee \bar{C}) \wedge \ldots$



no edges in the Δ for each clause, set k = # of clauses