Class NP &

Class NP-Complete

Efficient certification

3-SAT   certificate t is an assignment of truth values to variables (x_i)

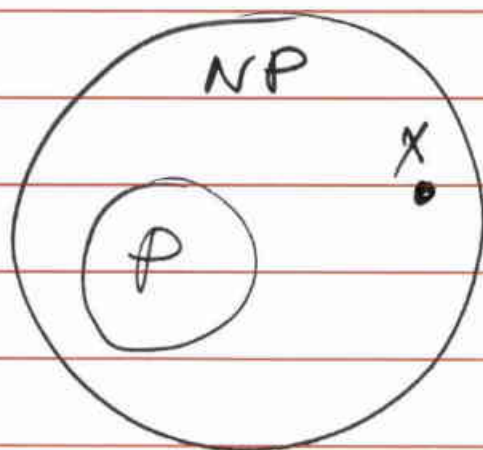Certifier: evaluates the clauses if all of them evaluate to 1 then it answers yes.

indep set   certificate t is a set of nodes of size at least k in G.

certifier: check ~~edge~~ each edge to make sure no edges have both ends in the set.

check size of set $\geq k$

no repeating nodes

Class NP is the set of all problems for which there exists an efficient certifier

Is $P = NP$?   open problem

if $X \in NP$ and for all $Y \in NP$
$Y \leq_p X$ then X is the hardest problem in NP.

Such a problem is called
                    NP-complete

3-SAT has been proven to be
                    NP-complete

Transitivity

if $Z \leq_p Y$ and $Y \leq_p X$

then $Z \leq_p X$

$3SAT \leq_p indep set \leq_p vertex cover \leq_p set cover$

Basic strategy to prove a
problem X is NP-complete

1- Prove $X \in NP$

2- choose a problem Y that is
known to be NP-complete

3- Prove that $Y \leq_p X$