Cook's theorm

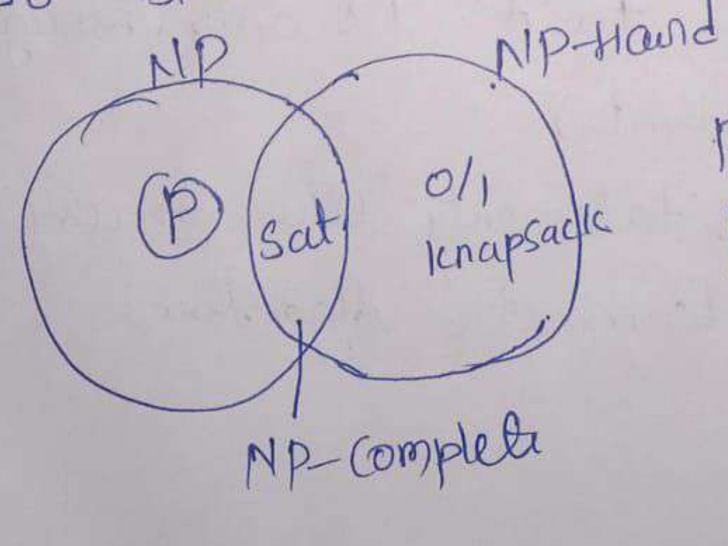
→ the scientist stephen cook in 1971 stated that boolean satisfiability problem is in NP-complete problem.

→ Cook's theorm states that the satisfiability (SAT) is in P, iff $\boxed{P=NP}$.

proof: shows that satisfiability problem is NP-complete.

* SAT is in NP, because a Non-Deterministic Algorithm can guess an assignment of truth value of variables. An expression is satisfiable if it value takes true.

* SAT is in NP-complete, such that SAT ∈ NP and any ~~problem~~ NP-problem can be reduced to SAT, so SAT is NP-Hard



$P \subseteq NP$

$P = NP$ (cook's theorm)

Ex CNF

$\Rightarrow (x_1 \vee x_2 \vee \bar{x}_3) \wedge (\bar{x}_1 \vee \bar{x}_2 \vee \bar{x}_3)$

let $x_1 = 1$, $x_2 = 0$, $x_3 = 0$

$= (1 \vee 0 \vee 1) \wedge (0 \vee 1 \vee 1)$

$= 1 \wedge 1 \Rightarrow 1$ (True)

→ Hence, we can prove SAT is in np-complete because SAT ∈ NP

Certain assumptions considered are

→ execution of algorithm 'A' is done on a word oriented system where length of each word is 'w' bits.

→ All variables in 'A' are defined using either integer / Boolean.

→ I/p provided to 'A' is only through arguments (no constants)

→ additional statements like Success(), Failure() b in (Non-Deterministic Algorithm)