the class P

$$P = \bigcup_k TIME(n^k)$$

on a deterministic TM

the class NP:

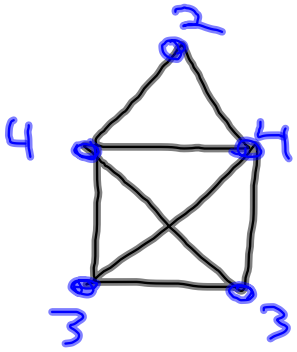
problems solved in polynomial time by a non-deterministic TM.

Problems $\Rightarrow$ Languages

Algorithms $\Rightarrow$ Turing deciders

Solutions to problems

- construct a solution
- prove a solution exists
- verify that a candidate solution is correct.



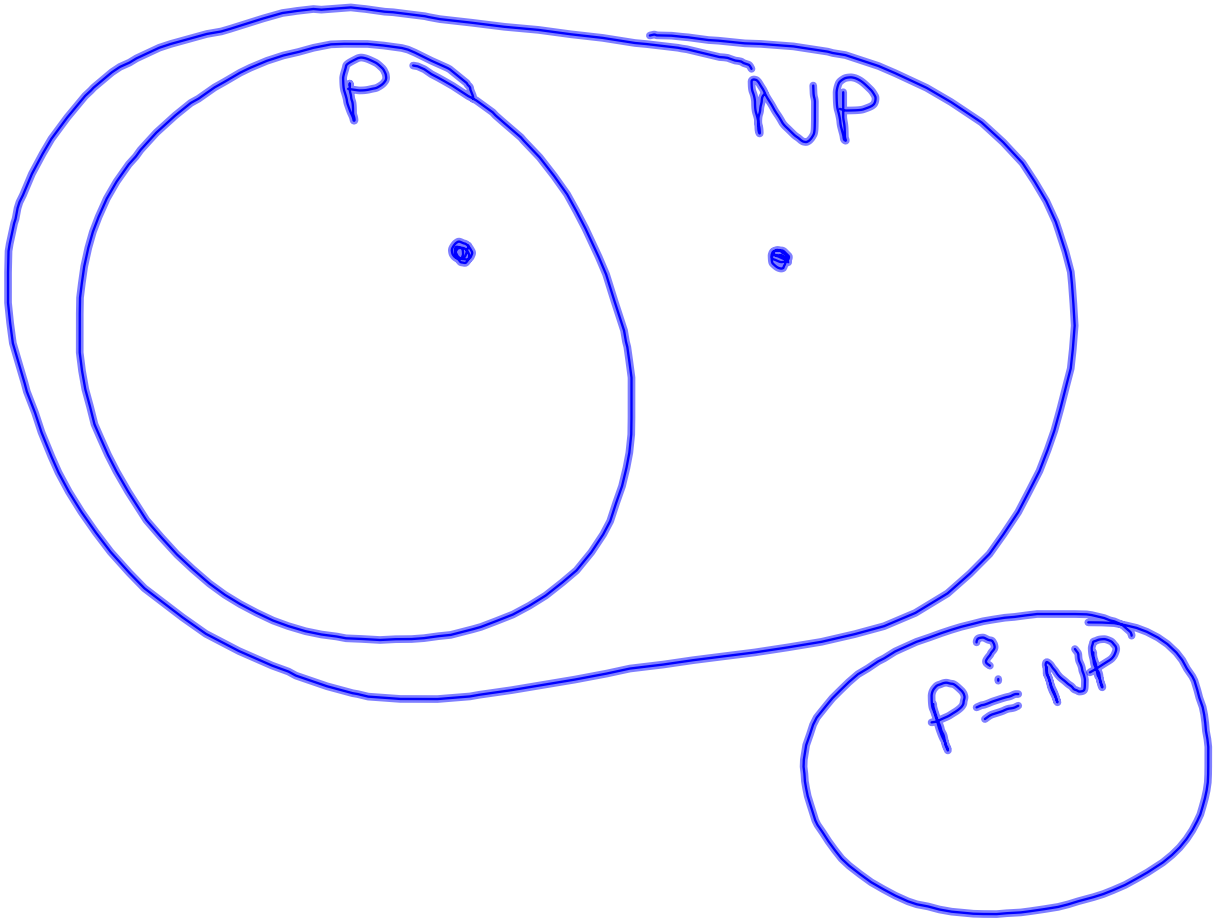
Euler Paths $\in P$

goes through every edge exactly once.

If a graph contains at most 2 odd-degree nodes, then it has an Euler path.

Hamiltonian Path: goes through every node exactly once.

$\in NP$


P
NP
P ?= NP

NP - class of languages w/ P time verifiers

HAMPATH = $\{\langle G, s, t\rangle \mid$ G is a directed graph w/ a Hamiltonian path from nodes s to t$\}$

A verifier for a language A is an algorithm V where

$A = \{w \mid V$ accepts $\langle w, c\rangle$ for some string $c\}$

c: certificate (candidate solution)

HAMPATH Verifier:

V on input $\langle \langle G, s, t\rangle, P\rangle$

does P represent a Hamiltonian path in G from s to t?