# Class coNP

$$\text{coNP} = \{ L : \neg L \in \text{NP} \}$$

## Alternate definition

$L \in \text{coNP}$ if $\exists$ a polynomial $p : \mathbb{N} \to \mathbb{N}$ & a poly-time DTM $M$ s.t.

$$x \in L \iff \forall\, u \in \Sigma^{p(|x|)} \text{ s.t. } M(x,u) \text{ accepts.}$$

## Examples

- $\neg$SAT $= \{ \phi : \phi \text{ is not satisfiable} \}$
- TAUTOLOGY $= \{ \phi : \phi$ is true for every assignment $\}$.

$L \in$ coNP-Hard if $\forall A \in coNP,\ A \leq_p L$

$L \in$ coNP-Complete if $L \in coNP$ & $L$ is coNP-Hard

Question $NP \overset{?}{=} coNP$ is open. & related to the $P \overset{?}{=} NP$ question.