• Where is coNP in our picture?
• For any finite sized language in NP, the complement of that language will be infinitely large, which doesn’t seem useful.

\[ P \subseteq \text{coNP} \quad \text{coNP} \subseteq \text{EXP} \]

Let \( L \in P \). Then there exists a polytime \( TM \) such that \( M(x) = 1 \) iff \( x \in L \). Consider \( TM \) \( M' \) that outputs the opposite of \( M \) \( (\text{accept} \leftrightarrow \text{reject}) \). \( M' \) decides \( \bar{L} \), therefore \( \bar{L} \in P \). Thus \( \bar{L} \in \text{NP} \). So \( \bar{L} \in \text{coNP} \).

Let \( L \in \text{coNP} \). Then \( \bar{L} \in \text{NP} \). Then \( \bar{L} \in \text{EXP} \). Thus \( L \in \text{EXP} \).

\[ \exists \text{ exponential time } TM \ M \text{ that decides } L \text{. Consider } M' \text{ that acts like } M \text{ but exchanges } \text{accept} \leftrightarrow \text{reject} \]

\( M' \) decides \( L \).

\[ \text{accept} \quad \text{reject} \]