Proof

Construct a TM, $D \in \hat{M}$, with S.C. $O(n^3)$

s.t. $\forall A \in \hat{M}$ with S.C. $O(n^2)$, $\forall n \geq n_0$, $t_A(n) \leq a \cdot n^2$

Let $w = \langle A \rangle 10^m$ where Let $n = |\langle A \rangle| + 1 + m$

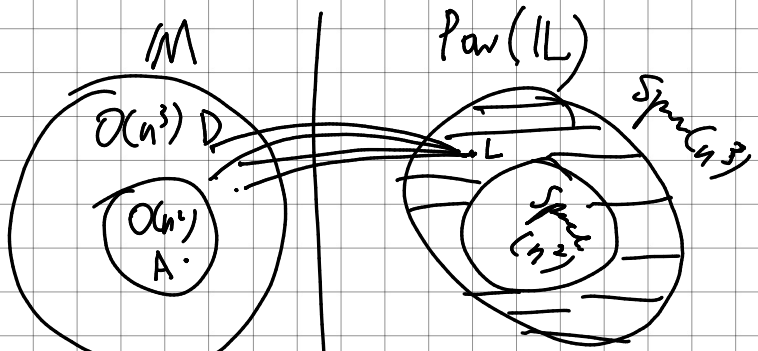
$n \geq n_0 \wedge n \geq a$

$$A(w) \neq D(w)$$

$\Rightarrow$ Let $L = \{ w \mid \forall A \in \hat{M}$ with S.C. $O(n^2)$, $w = \langle A \rangle 10^m$ where $\sim \}$

$\Rightarrow L \in \{$ all languages decidable by $D\}$

but $L \notin \{$ all langues decidable by $A \mid \forall A \in \hat{M}$ with S.C. $O(n^2)\}$



each machine recognize the power set of a Free language.

Could have multiple TMs recognize the same language