

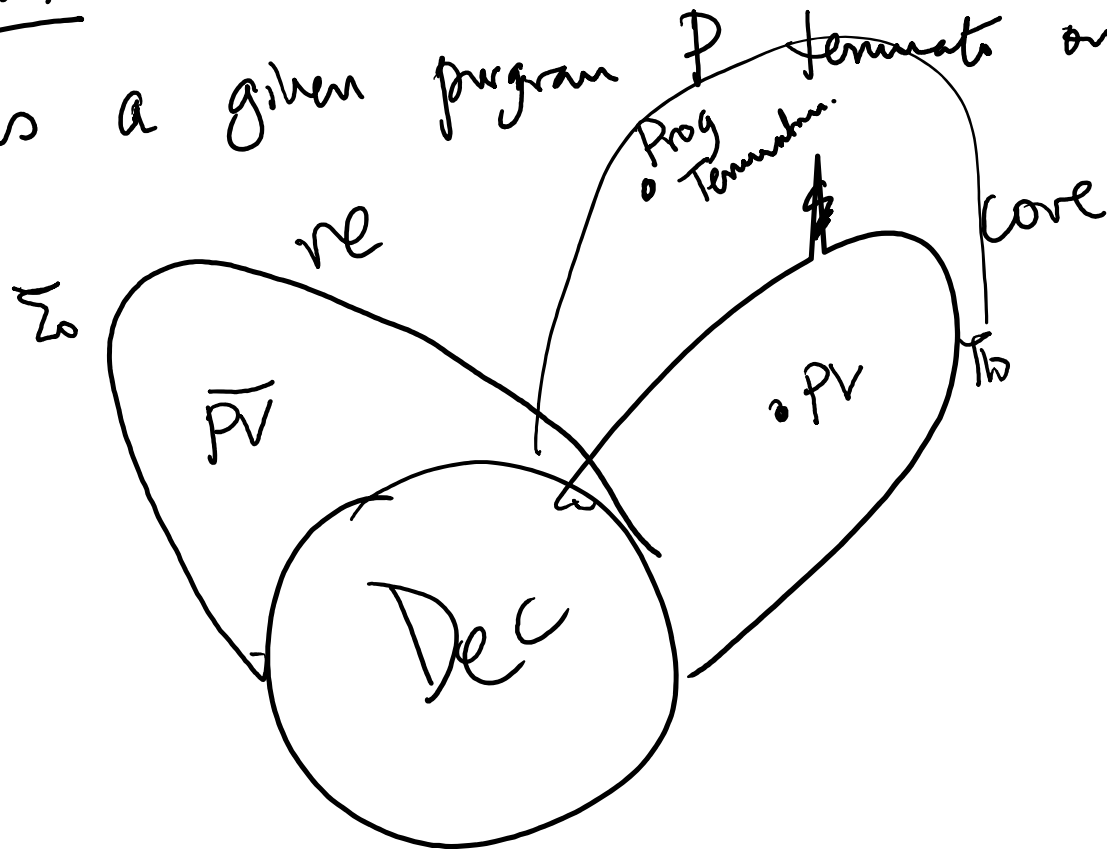
CS477

Termination



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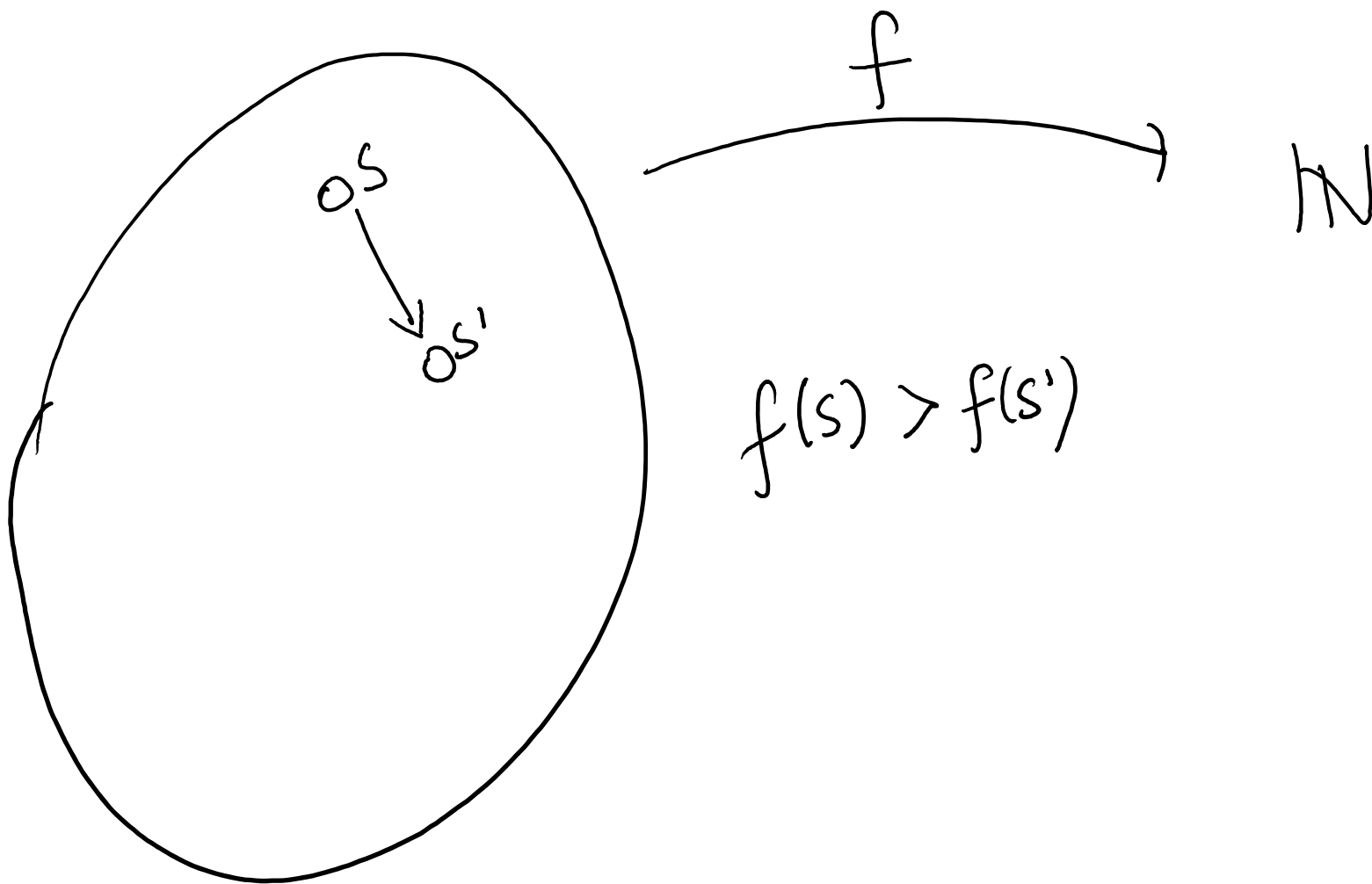
Does a given program P terminate on all inputs?



Equality : Given a TM, does it terminate
on all inputs?

Π_1 - complete

$$L = \{ \langle TM \rangle \mid \exists \text{ input } w \text{ s.t. } \nexists n \text{ TM does not halt in time } n \}$$



$\mathbb{N}$

$0 \rightarrow 1 \rightarrow 2 \rightarrow 3 \rightarrow \dots$

$(W, \leq)$ any order such that
there are no infinite descending chains $\rightarrow$ strictly

$\exists s_0, s_1, s_2, \dots$ s.t. $s_i > s_{i+1} \forall i \in \mathbb{N}$

I can now make $\leq$ a partial order.

Well-founded orders

$$W = \{ (a, b) \mid a, b \in \mathbb{N} \}$$

$$\leq \equiv (a, b) \leq (c, d) \text{ iff } a < c \text{ or } (a = c \wedge b \leq d)$$

Reflexive.

Transitive.

Antisymmetric.

$$\begin{array}{l} (a, b) \leq (c, d) \quad (c, d) \leq (a, b) \\ \hline a = c \wedge b = d \end{array}$$

