THM: $PC \subseteq PF$ iff $P = NP$

$PC \subseteq PF \Rightarrow$ For each $S \in NP$, consider the verification V and let $R \stackrel{\text{def}}{=} \{(x,y) : V(x,y) = 1\}$.

Then $R \in PC \Rightarrow R \in PF$.

Decide S by finding a witness

(note: $S = S_R = \{x : R(x) \neq \emptyset\}$)

$P = NP \Rightarrow$ For each $R \in PC$,

let $S \stackrel{\text{def}}{=} \{\langle x, y' \rangle : \exists y'' \ (x, y'y'') \in R\}$.

Then $S \in NP \Rightarrow S \in P$.

Find solution of x by extending a prefix-solution bit-by-bit

Typical iteration starts with y' that is a prefix-solution

- If $(x, y'0), (x, y'1) \notin S$, then $y' \in R(x) \Rightarrow$ output y'
- If $(x, y'\sigma) \in S$ for some $\sigma \in \{0,1\}$ then $y' \leftarrow y'\sigma$

בינתיים: התחל בבדיקה $(x,\lambda) \overset{?}{\in} S$

אם התשובה לא ($R(x)=\emptyset$ כ"ס) פלט $\perp$