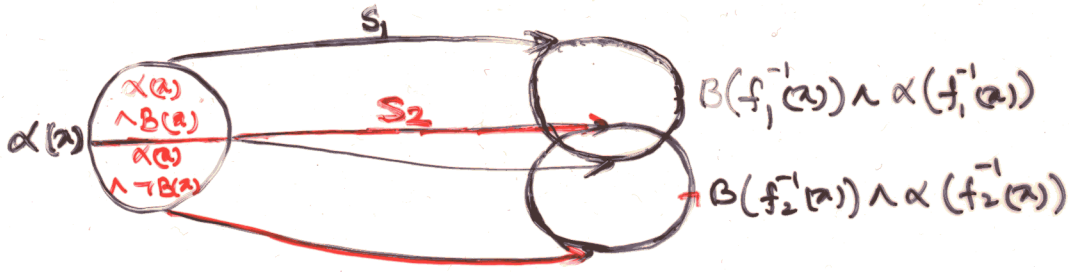
Inference rules for assignments (ctnd)

- Alternative form of (iv) ("pre-to-post" form)

$\alpha(x)\ \{$ if $B(x)$ then S_1 else $S_2\}\ [B(f_1^{-1}(x)) \wedge \alpha(f_1^{-1}(x))] \vee [B(f_2^{-1}(x)) \wedge \alpha(f_2^{-1}(x))]$



Example: Consider precond. $[x=7]$ for statement "if $[y<x]$ then $y \leftarrow x$"

Here $f_1(y) = x \Rightarrow f_1^{-1}(x) = y$; f_2 is identity fn.

$B(x) = [y<x] \Rightarrow B(f_1^{-1}(x)) = [y<y]$

$\alpha(x) = [x=7] \Rightarrow \alpha(f_1^{-1}(x)) = [y=7]$, $\alpha(f_2^{-1}(x)) = [x=7]$

$\neg B(x) = [y \geq x] \Rightarrow \neg B(f_2^{-1}(x)) = [y \geq x]$

Strongest postcond. $\equiv ([y<y] \wedge [y=7]) \vee ((y \geq x) \wedge (x=7))$

$\equiv$ FALSE $\vee$ $(y \geq 7)$ $\equiv (y \geq 7)$.

$[x=7]\ \{$if $[y<x]$ then $y \leftarrow x\}\ [y \geq 7]$

(v) More if-then-else inference rule

$$\frac{\alpha(x) \wedge B(x)\ \{S_1\}\ \beta(x) \qquad \alpha(x) \wedge \neg B(x)\ \{S_2\}\ \beta(x)}{\alpha(x)\ \{\text{if } B(x) \text{ then } S_1 \text{ else } S_2\}\ \beta(x)}$$

$$\frac{\alpha(x) \wedge B(x)\ \{S\}\ \beta(x) \qquad \alpha(x) \wedge \neg B(x) \rightarrow \beta(x)}{\alpha(x)\ \{\text{if } B(x) \text{ then } S\}\ \beta(x)}$$

This rule is less useful than more direct rules given in (iv).