HW4
#5

Let
$a \beta b := (\exists k \geq 1 \; \pi^k \models b) \Rightarrow (\exists j < k \; \pi^j \models a)$

This is equivalent to

$\neg(\exists k \geq 1 \; \pi^k \models b) \vee (\exists j < k \; \pi^j \models a)$

$(\forall k > 0 \; \pi^k \not\models b) \vee (\exists j < k \; \pi^j \models a)$

$\neg[(\exists k > 0 \; \pi^k \models b) \wedge (\forall j < k \; \pi^j \models \neg a)]$

$\neg[\neg a \; U \; b]$

Thus $a \beta b \iff \neg[\neg a \; U \; b]$