Exercício 1

Mostrar que:

$$\{x > 0\} \ \text{y:=1; while } \neg \ (\text{x} = 1) \text{ do } (\text{y} := \text{y * x; x := x - 1}) \ \{y >= 1\}$$

$$\cfrac{\cfrac{}{\{1 \geq 1 \wedge x > 0\} \ \text{y} := 1 \ \{y \geq 1 \wedge x > 0\}} \text{Assigns} \quad \cfrac{PI \quad IQ \quad \Pi_{\text{inv}}}{\{y \geq 1 \wedge x > 0\} \ \text{while} \ \neg \ (\text{x} = 1) \text{ do } (\text{y} := \text{y * x; x := x - 1}) \ \{y \geq 1\}} \text{While}}{\{x > 0\} \ \text{y:=1; while} \ \neg \ (\text{x} = 1) \text{ do } (\text{y} := \text{y * x; x := x - 1}) \ \{y \geq 1\}} \text{Seq}$$

- $I = y \geq 1 \wedge x > 0$

- $PI = y \geq 1 \wedge x > 0 \Rightarrow y \geq 1 \wedge x > 0$

- $IQ = y \geq 1 \wedge x > 0 \wedge x = 1 \Rightarrow y \geq 1$

- $\Pi_{\text{inv}} =$

$$\cfrac{\cfrac{}{\{y * x \geq 1 \wedge x - 1 > 0\} \ \text{y} := \text{y * x} \ \{y \geq 1 \wedge x - 1 > 0\}} \text{Assigns} \quad \cfrac{}{\{y \geq 1 \wedge x - 1 > 0\} \ \text{x} := \text{x - 1} \ \{I\}} \text{Assigns}}{\cfrac{\{y * x \geq 1 \wedge x - 1 > 0\} \ \text{y} := \text{y * x; x := x - 1} \ \{I\}}{\{I \wedge x \neq 1\} \ \text{y} := \text{y * x; x := x - 1} \ \{I\}} \text{S/W, } y * x \geq 1 \wedge x - 1 > 0 \Rightarrow I} \text{Seq}$$

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