309 Here are two different definitions of variable declaration with initialization.

$$\textbf{new } x\text{: } T := e\cdot P \quad = \quad \exists x, x'\text{: } T\cdot\ x{=}e \land P$$

$$\textbf{new } x\text{: } T := e\cdot P \quad = \quad \exists x'\text{: } T\cdot \text{ (substitute } e \text{ for } x \text{ in } P\text{)}$$

Show how they differ with an example.

After trying the question, scroll down to the solution.

§ Let e be x and P be $y'=x$. Then

$$\begin{array}{ll} & \exists x, x' \cdot x=e \wedge P \\ = & \exists x, x' \cdot x=x \wedge y'=x \\ = & \exists x, x' \cdot y'=x \\ = & \top \end{array}$$

But

$$\begin{array}{ll} & \exists x' \cdot \text{(substitute } e \text{ for } x \text{ in } P\text{)} \\ = & \exists x' \cdot \text{(substitute } x \text{ for } x \text{ in } y'=x\text{)} \\ = & \exists x' \cdot y'=x \\ = & y'=x \end{array}$$

The one-point law

$$\exists x \cdot x=e \wedge P \;=\; \text{(substitute } e \text{ for } x \text{ in } P\text{)}$$

applies only when e does not mention x . So it does not apply in my example.