Suppose variable declaration with initialization is defined as
\[
\text{var } x : T := e \cdot P = \text{ var } x : T \cdot x := e \cdot P
\]
In what way does this differ from the definition given in Subsection 5.0.0?

§ According to Subsection 5.0.0,
\[
\text{var } x : T := e \cdot P
\]
\[
= \exists x : e \cdot \exists x' : T \cdot P
\]
\[
= (\text{for } x \text{ substitute } e \text{ in } \exists x' : T \cdot P) \quad \text{assuming } T \text{ cannot mention } x
\]
\[
= \exists x' : T' \quad (\text{for } x \text{ substitute } e \text{ in } P) \quad \text{assuming } e \text{ cannot mention } x
\]
\[
= \exists x : T' \cdot \exists x' : T' \quad (\text{for } x \text{ substitute } e \text{ in } P') \quad \text{substitution law}
\]
\[
= \exists x, x' : T' \cdot (\text{for } x \text{ substitute } e \text{ in } P)
\]
\[
= \text{var } x : T \cdot x := e \cdot P
\]

With the three assumptions, there's no difference. So let's violate those assumptions. First, let \( T = x+1 \).

\[
\text{var } x : x+1 \cdot x := e \cdot P
\]
\[
= \exists x, x' : x+1 \cdot (x := e \cdot P)
\]
\[
= \exists \langle x : x+1 \rightarrow \exists x' : x+1 \cdot (x := e \cdot P) \rangle
\]

Section 3.0 defines a function by saying “Let \( v \) be a name, and let \( D \) be a bunch of items (possibly using previously introduced names but not using \( v \)), ...”. We do not have a definition of \( \langle x : x+1 \rightarrow ... \rangle \).

Next, suppose \( e = x+1 \).

\[
\text{var } x : T := x+1 \cdot P
\]
\[
= \exists x : x+1 \cdot \exists x' : T \cdot P
\]
\[
= \exists \langle x : x+1 \rightarrow \exists x' : T \cdot P \rangle
\]

So again we do not have a definition of \( \langle x : x+1 \rightarrow ... \rangle \).

Last, suppose \( e = x'+1 \).

\[
\text{var } x : T := x'+1 \cdot P
\]
\[
= \exists x : x'+1 \cdot \exists x' : T \cdot P
\]

The \( x' \) appearing first is not the same variable as the \( x' \) appearing second.