

- 500 The Substitution Law does not work for interactive variables.
- (a) Show an example of the failure of the law.
 - (b) Develop a new Substitution Law for interactive variables.

After trying the question, scroll down to the solution.

(a) Show an example of the failure of the law.

§ Let x be an interactive variable, and let t be time. Suppose an assignment takes time 1.

$$x := 3. \quad x' = x \wedge t' = t \quad = \quad x' = 3 \wedge t' = t + 1$$

whereas the Substitution Law would say $x' = 3 \wedge t' = t$. The problem is that assignment to an interactive variable has to take time.

(b) Develop a new Substitution Law for interactive variables.

§ Let a be the time for the assignment. Let y be any other interactive variable.

$$\begin{aligned} & x := e. \quad P \\ = & \quad x(t+a) = e \quad \wedge \quad (\forall t''. \quad t \leq t'' \leq t+a \Rightarrow y'' = y) \quad \wedge \quad (\text{substitute } t+a \text{ for } t \text{ in } P) \end{aligned}$$