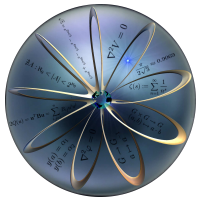

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semantic properties of substitutability

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In addition, we also have the following semantic properties on substitutability:

1. If x, y are respectively free for z in A, and do not occur free in A, then

$$\models \exists x A[x/z] \leftrightarrow \exists y A[y/z] \qquad \text{and} \qquad \models \forall x A[x/z] \leftrightarrow \forall y A[y/z]$$

2. (substitution theorem)
   - $\models (t_1 = t_2) \rightarrow (s[t_1/x] = s[t_2/x])$
   - $\models (t_1 = t_2) \rightarrow (A[t_1/x] = A[t_2/x])$

3. Every wff A is equivalent to a wff A' in the sense $\models A \leftrightarrow A'$ such that A' contains no variables that are both free and bound.