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0.1 Inference rules for first-order logic

0.1.1 Existential instantiation

If P is true for a specific input, then there exists an input for P where P is true.

$$P(r) \Rightarrow \exists x P(x)$$

0.1.2 Existential generalisation

$$\exists x P(x) \Rightarrow P(r)$$

Where r is a new symbol.

0.1.3 Universal instantiation

If P is true for all values of x , then P is true for any input to P .

$$\forall x P(x) \Rightarrow P(a/x)$$

Where a/x represents substituting a for x within P .

0.1.4 Universal generalisation

If there is a derivation for $P(x)$, then there is a derivation for $\forall x P(x)$.

$$\vdash P(x) \Rightarrow \vdash \forall x P(x)$$