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 $\forall x P(x)$.

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