Some Examples

Prove $\Gamma \Rightarrow A$ where $A = \exists x(\text{dead}(x))$ and $\Gamma =$:

$$\forall x \forall y((\text{bug}(x) \land \text{jar}(y) \land \text{in}(x, y) \land \text{heated}(y)) \Rightarrow \text{dead}(x))$$

$$\text{heated}(tj) \land \text{bug}(tb) \land \text{jar}(tj) \land \text{in}(tb, tj)$$
Some Examples

Sometimes, as in the last example, it is possible to extract an *answer substitution*. Sometimes it’s not. Consider:

\[(p(a) \lor p(b)) \Rightarrow \exists x(p(x))\]

\[\exists x(p(x)) \Rightarrow \exists x(p(x))\]
Some Examples

Here is an example where we will need to refer to a clause a number of times and pick different substitutions.

Suppose a list is constructed from the empty list, \textit{nil}, and the \textit{cons} operator.

- An item is in a list if it is the element at the front of the list (i.e. the left argument of the top-level \textit{cons}).

- An item is in a list if it is in the tail of the list (the right argument of the top-level \textit{cons}).
Some Examples

Show that 3 is in the list $[1,2,3,4]$.

Show that 3 is not in the list $[1,2,4]$.