Using my Proof Tree macros, you can produce

\[
\begin{prooftree}
\begin{array}{c}
\exists y. ((\exists x_n = y) \land qy) \land (\forall w. ((\exists x_n = w) \Rightarrow pw)) \end{array}_\alpha \\
\downarrow \land \text{elim} 1
\begin{array}{c}
\exists y. ((\exists x_n = y) \land qy) \land (\forall w. ((\exists x_n = w) \Rightarrow pw)) \end{array}_\alpha \\
\downarrow \exists \text{E}
\begin{array}{c}
\exists x_n = y \land qy \end{array}_\alpha \\
\downarrow \exists \text{E}
\begin{array}{c}
\exists y. ((\exists x_n = y) \land qy) \land (\forall w. ((\exists x_n = w) \Rightarrow pw)) \end{array}_\alpha \\
\downarrow \exists \text{I}
\begin{array}{c}
\exists z. pz \land ((\exists x_n = z) \land qz) \end{array}_\alpha \\
\end{prooftree}
\]

using the $\TeX$ or $\LaTeX$ code

\begin{verbatim}
\input prooftree
\begin{prooftree}
\exists y. ((\exists x_n = y) \land qy) \land (\forall w. ((\exists x_n = w) \Rightarrow pw)) \Rightarrow (\exists z. pz \land ((\exists x_n = z) \land qz))
\end{prooftree}
\end{verbatim}
\[ \text{allelim} \]
\[ (\forall y \ n) \text{imp} \ P y \]
\[ [ (\forall y \ n) \text{land} \ Q y ] _ \beta \]
\[ \text{andelim1} \]
\[ \forall y \ n \]
\[ \text{impelim} \text{ shiftright50pt} \]
\[ P y \]
\[ \text{kern-25pt} \]
\[ [ (\forall y \ n) \text{land} \ Q y ] _ \beta \]
\[ \text{andintro} \]
\[ P y \text{land}( (\forall y \ n) \text{land} \ Q y ) \]
\[ \text{existsintro} \]
\[ \forall C z n \]
\[ \text{existselim} _ \beta \]
\[ \forall C z n \]
\[ \text{impintro} _ \alpha \]
\[ (\forall y \ n) \text{land}( (\forall y \ w) \text{imp}( \forall C z n ) ) \]
\[ \text{end{prooftree}$}$

In fact the commands \texttt{allintro, etc.,} are not primitive; the basic form is

\[ A \quad B \]
\[ \begin{array}{l}
\text{justifies} \\
A \ \text{land} \ B \\
\text{thickness=0.08em} \\
\text{shiftright 2em} \\
\text{using} \\
\{ \text{land}\{ \text{cal I}\} \}
\end{array} \]

which gives

\[
\begin{array}{c}
A \quad B \\
\text{A \land B} \\
\text{A \land B} \\
\text{\land I}
\end{array}
\]

The hypotheses may themselves be proof trees (enclosed in \texttt{[...\]} ) and the purpose of the macros is to adjust the length of the horizontal “deduction” line.
When the hypotheses are proof trees, suitable space is put between them, but of course this must be supplied by hand for simple formulae. The \texttt{\textbackslash thickness} and \texttt{\textbackslash shiftright} commands are, of course, optional; they apply to the horizontal line and to the positioning of the conclusion relative to it. For a double line, use \texttt{\textbackslash Justifies} instead of \texttt{\textbackslash justifies}.

Notice the overloading of the \texttt{\{\ldots\}}; the outermost proof tree must be enclosed with \texttt{\begin{prooftree}} and \texttt{\end{prooftree}} or \texttt{\prooftree} and \texttt{\endprooftree}.

To get a vertical string of dots instead of the proof rule, do

\[
[ \\
[ A ] \\
\texttt{\textbackslash using} \\
\texttt{\textbackslash pi} \\
\texttt{\textbackslash proofdotseparation=1.2ex} \\
\texttt{\textbackslash proofdotnumber=4} \\
\texttt{\leadsto} \\
B \\
] \\
\]

\texttt{[A]} to get \ldots \pi \ldots \texttt{B}

All of of the keywords except \texttt{\prooftree} and \texttt{\endprooftree} are optional and may appear in any order. They may also be combined in \texttt{\newcommand}s, for example

\texttt{\newcommand\Cut{\texttt{\textbackslash using}\texttt{\textbackslash sf cut}\texttt{\textbackslash thickness=0.9ex}\texttt{\textbackslash justifies}}}

with the abbreviation

\[
[ A \texttt{\textbackslash vdash B} \texttt{\textbackslash quad} \\
B \texttt{\textbackslash vdash C} \\
\texttt{\textbackslash Cut} \\
A \texttt{\textbackslash vdash C} \\
] \\
\]

\texttt{\textbackslash thickness} specifies the breadth of the rule in any units, although font-relative units such as ex or em are preferable. It may optionally be followed by \ldots \texttt{\textbackslash proofrulebreadth=0.08em} or \texttt{\setlength\texttt{\textbackslash proofrulebreadth}{0.08em}} may also be used either in place of \texttt{\textbackslash thickness} or globally; the default is 0.04em. \texttt{\textbackslash proofdotseparation} and \texttt{\textbackslash proofdotnumber} control the size of the string of dots.

If proof trees and formulae are mixed, some explicit spacing is needed, but don’t put anything to the left of the left-most (or the right of the right-most)
hypothesis, or put it in braces, because this will cause the indentation to be lost.

By default the conclusion is centered wrt the left-most and right-most immediate hypotheses (not their proofs): \texttt{\textbackslash shiftright} or \texttt{\textbackslash shiftleft} moves it relative to this position. (Not sure about this specification or how it should affect spreading of proof tree.)