ND.sty
Lemmon-style natural deduction proofs

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This package provides an environment—ND—for typesetting Lemon-style natural deduction proofs. Basically, it creates three minipages for the assumption column, the formula column and the rule column. The first and the third of these figure out how much space they need by themselves, and the space for the second is adjusted accordingly. Lines are typeset in the ND environment with the command \ndl (for **n**atural **d**eduction **l**ine). \label and \ref are temporarily redefined within ND for ease of referring to line numbers within a proof. Finally, three user commands are provided for use outside of the environment: \ndref, \awidth and \rwidth.

\begin{ND}   The ND environment takes 5 optional arguments, namely
\end{ND}

\begin{ND}[⟨*title*⟩][⟨*label*⟩][⟨*width of assumption column*⟩][⟨*width of rule column*⟩][⟨*total width*⟩]

⟨*title*⟩ is the title the proof will have (e.g. 'Proof'), ⟨*label*⟩ is the label with which the proof can later be referred to (see below), the column width arguments specify a fixed width (i.e. a length) for assumption and rule columns respectively. If the ⟨*label*⟩ argument is not specified, the proof will get its number as a label (which is not ideal when you want to refer to it later on). If the column width arguments are not specified, the width is calculated automatically (this is done by writing to the aux file, so that two runs of latex are necessary to get the width of the columns right). If the ⟨*total width*⟩ argument is not specified the proof will take up the whole available width (i.e. it's as if ⟨*total width*⟩ had been set to \linewidth).

\ndl   Lines within the ND environment are typeset with the \ndl command. It has three mandatory arguments, namely

\ndl{⟨*assumption list*⟩}{⟨*formula*⟩}{⟨*rule*⟩}

The ⟨*formula*⟩ and ⟨*rule*⟩ arguments—but not the ⟨*assumption list*⟩ argument—can have line breaks specified with the help of \\ (the use of \newline instead of \\ in ⟨*rule*⟩ screws with the automatic width calculation).

\ndref   Within the ND environment, \label and \ref are redefined, so that finding a unique label isn't so difficult (\label picks up the line number of the current line). If you want to refer to line numbers outside of the ND environments in which they have been labelled, you need to use \ndref{⟨*proof label*⟩}{⟨*line label*⟩}, since \ref will have gone back to its usual definition. For instance, if you labelled a line number within a proof with the label theproof by writing \label{1}, it can be referred to within the same ND environment simply by writing \ref{1}, but outside of the environment you have to use \ndref{theproof}{1} instead.

\awidth   Sometimes you may want to align the assumption and rule columns of one proof with those
\rwidth   of another. This can be done by using \awidth{⟨*proof label*⟩} and \rwidth{⟨*proof label*⟩} in the

width arguments of the ND environment. For instance, if you want a proof to have the same layout as a proof that you've labelled theproof, you would begin the new ND environment by writing

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\begin{ND}[Some name][Some label][\awidth{theproof}][\rwidth{theproof}]
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The new proof would then not choose its layout according to its own needs, but would simply take over the column widths of the other proof.

For illustration, I include the source code of the following example:

Proof

	(1)	$\forall x\, x = x$	irrelevant but true
2	(2)	Fa	A
3	(3)	$\forall x\,(Fx \rightarrow Gx)$	A
3	(4)	$Fa \rightarrow Ga$	3, $\forall$E
2, 3	(5)	Ga	4, 2, $\rightarrow$E
2	(6)	$\forall x\,(Fx \rightarrow Gx) \rightarrow Ga$	4, 5, $\rightarrow$I
	(7)	$Fa \rightarrow (\forall x\,(Fx \rightarrow Gx) \rightarrow Ga)$	2, 6, $\rightarrow$I

Note line 7 of this proof.

Another Proof

	(1)	$a = a$	=I
	(2)	$\forall x\, x = x$	1, $\forall$I

Note line 2 of this proof.

Figure 1: Example

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1  \begin{ND}[Proof][theproof][][][.8\linewidth]
2  \ndl{}{$\forall x\, x = x$}{irrelevant\\but true}
3  \ndl{\ref{1}}{$Fa$}{A}\label{1}
4  \ndl{\ref{2}}{$\forall x\,(Fx\rightarrow Gx)$}{A}\label{2}
5  \ndl{\ref{2}}{$Fa\rightarrow Ga$}{\ref{2}, $\forall$E}\label{3}
6  \ndl{\ref{1},\ref{2}}{$Ga$}{\ref{3}, \ref{1}, $\rightarrow$E}\label{4}
7  \ndl{\ref{1}}{$\forall x\,(Fx\rightarrow Gx)\rightarrow Ga$}
8        {\ref{3}, \ref{4}, $\rightarrow$I}\label{5}
9  \ndl{}{$Fa\rightarrow(\forall x\,(Fx\rightarrow Gx)\rightarrow Ga)$}
10       {\ref{1}, \ref{5}, $\rightarrow$I}\label{6}
11 \end{ND}
12 \noindent Note line \ndref{theproof}{6} of this proof.
13
14 \begin{ND}[Another Proof][][\awidth{theproof}][\rwidth{theproof}][.8\linewidth]
15 \ndl{}{$a=a$}{$=$I}\label{1}
16 \ndl{}{$\forall x\,x=x$}{\ref{1}, $\forall$I}\label{2}
17 \end{ND}
18 \noindent Note line \ndref{2}{2} of this proof.
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