

Guidance on Typesetting Homework*

Robert Harper

September 3, 2025

The `pl-syntax` and `pl-judgments` packages provide macros for typesetting pieces of syntax and for various judgment forms that arise in type theory. These are downloadable from <https://github.com/RobertHarper/pl-syntax>, and include full documentation. Simply clone the package into a directory in which you have arranged for L^AT_EX usage. The package option `[abt]` permits direct usage of macros for abstract binding trees (abt's) used in Harper (2016).

Generally speaking the “starred form” of a syntax macro is the “concrete syntax”, which by default omits the (optional) square-bracketed arguments used for types. Otherwise “abstract syntax” is typeset, with all arguments typeset in abt form.

The `mathpartir` package, which is available on CTAN, is an INRIA package for typesetting “math paragraphs” and “inference rules”, hence the name. Rules are typeset as follows,

```
\begin{mathpar}
  \inferrule[rule]
    {\dots \textit{premises} \dots}
    {\textit{conclusion}}
\end{mathpar}
```

resulting in

$$\frac{\text{RULE} \quad \dots \textit{premises} \dots}{\textit{conclusion}}$$

Multiple premises are separated by `\\`, and stacked premises are separated by `\\|`. Coalescing of rules can be bypassed using `\\|` to insert a vertical break, otherwise it is “best fit.”

Thus, for example, the rules

$$\frac{\rightarrow\text{-I} \quad \Gamma, x : A_1 \vdash M_2 : A_2}{\Gamma \vdash \lambda(x.M_2) : A_1 \rightarrow A_2} \qquad \frac{\rightarrow\text{-E} \quad \Gamma \vdash M : A_1 \rightarrow A_2 \quad \Gamma \vdash M_1 : A_1}{\Gamma \vdash \text{ap}(M_1; M_2) : A_2}$$

are typeset by the source code

*Copyright © Robert Harper. All Rights Reserved

```

\begin{mathpar}
  \inferrule{[\$ \to \$-I]}
  {\text{Ctx}\{\Gamma\}\{\text{ofTp}\{x\}\{A_1\}\}\text{entails } \text{ofTp}\{M_2\}\{A_2\}}
  {\Gamma\text{entails } \text{ofTp}\{\text{lamEx}\{x\}\{M_2\}\}\{\text{arrTy}\{A_1\}\{A_2\}\}}

  \inferrule{[\$ \to \$-E]}
  {\Gamma\text{entails } \text{ofTp}\{M\}\{\text{arrTy}\{A_1\}\{A_2\}\} \quad \Gamma\text{entails } \text{ofTp}\{M_1\}\{A_1\}}
  {\Gamma\text{entails } \text{ofTp}\{\text{appEx}\{M_1\}\{M_2\}\}\{A_2\}}
\end{mathpar}

```

Were the blank line to be replaced by `\\`, the two rules would be typeset on separate lines, each centered.

References

Robert Harper. *Practical Foundations for Programming Languages*. Cambridge University Press, Cambridge, England, Second edition, 2016.

```

\usepackage[authoryear,semicolon]{natbib}
\usepackage[T1]{fontenc}
\usepackage[utf8]{inputenc}
\usepackage{textgreek}
\usepackage{verbatim}
\usepackage{fullpage}
\setlength{\marginparwidth}{1in}
\usepackage[color=yellow]{todonotes}
\usepackage{xifthen}
\usepackage{comment}
\usepackage{url}
\usepackage{color}
\usepackage{stix2} \ProvideDocumentCommand{\wavydiv}{}{\mathrel{\kernelcontraction}}
\usepackage{amsmath,amsthm,stmaryrd}
\usepackage{colonequals}
\usepackage{stackrel}
\usepackage{mathpartir}

\usepackage[abt,sf]{pl-syntax}
\usepackage{pl-judgments}
\input{syntax}

\theoremstyle{plain}
\newtheorem{theorem}{Theorem}
\newtheorem{defn}[theorem]{Definition}
\newtheorem{lemma}[theorem]{Lemma}
\newtheorem{corollary}[theorem]{Corollary}
\newtheorem{exercise}{Exercise}
\newtheorem{conjecture}{Conjecture}

\usepackage{fancyhdr}
\pagestyle{fancy}
\renewcommand{\headrulewidth}{0pt}
\renewcommand{\footrulewidth}{0pt}
\fancyhead{}
\fancyfoot{}
\fancyfoot[R]{\today}
\fancyfoot[C]{\thepage}

```

Figure 1: Preamble