

LaTeX Quick Reference

Document structure, math, tables, figures, and more

Document Structure

Minimal Document

```
\documentclass{article}
\begin{document}
Hello, LaTeX!
\end{document}
```

Document Classes

article	Short documents, papers, reports
report	Longer documents with chapters
book	Full books with parts, chapters
beamer	Slide presentations
letter	Formal letters

Preamble

```
\documentclass[12pt, a4paper]{article}
\usepackage[utf8]{inputenc}
\usepackage{amsmath, graphicx}
\title{My Document}
\author{Alice}
\date{\today}
```

Sectioning

\part{}	Top-level division (book/report)
\chapter{}	Chapter (report/book only)
\section{}	Section
\subsection{}	Subsection
\subsubsection{}	Sub-subsection
\paragraph{}	Named paragraph

Text Formatting

Font Styles

\textbf{bold}	**Bold** text
\textit{italic}	*Italic* text
\underline{text}	Underlined text
\texttt{code}	Monospace / typewriter
\textsc{Small Caps}	Small capitals
\emph{emphasis}	Emphasis (context-aware italic)

Font Sizes

\tiny	Smallest
\small	Smaller than normal
\normalsize	Default size
\large / \Large	Larger / even larger
\huge / \Huge	Huge / largest

Spacing & Breaks

\\	Line break
\newpage	Page break
\vspace{1cm}	Vertical space
\hspace{1cm}	Horizontal space
\noindent	Suppress paragraph indent
~	Non-breaking space

Math Mode

Inline & Display Math

```
Inline:  $E = mc^2$  or  $\{( a^2 + b^2 = c^2 \}$ 
Display:  $\{ \int_{-\infty}^{\infty} e^{-x} dx = 1 \}$ 
Numbered:  $\{ \begin{equation} F = ma \label{eq:newton} \end{equation} \}$ 
```

Common Symbols

^ and _	Superscript / subscript: x^2, a_i
\frac{a}{b}	Fraction: a/b
\sqrt{x} / \sqrt[3]{x}	Square / cube root
\sum_{i=1}^n	Summation
\int_a^b	Integral
\lim_{x \to 0}	Limit
\infty	Infinity symbol

Greek Letters

\alpha \beta \gamma \delta	Lowercase Greek
\Gamma \Delta \Theta \Lambda	Uppercase Greek
\epsilon \sigma \omega \pi	More lowercase Greek
\mu \nu \rho \tau \phi	Statistical / physics common

Matrices

```
\begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}
% pmatrix = (), vmatrix = | |, Bmatrix = { }
```

Environments

Common Environments

document	Main content area
equation	Numbered math equation
align	Aligned multi-line equations
figure	Floating figure
table	Floating table
verbatim	Literal text (no formatting)
abstract	Abstract block (article)

Aligned Equations

```
\begin{align}
x &= a + b \\
y &= c + d
\end{align}
% & marks alignment point, \\ breaks lines
```

Lists & Tables

Lists

```
\begin{itemize}
\item Bullet point
\item Another item
\end{itemize}
\begin{enumerate}
\item First \item Second
\end{enumerate}
```

Tables

```
\begin{tabular}{|c|r|}
\hline
Name & Age & Score \\ \hline
Alice & 25 & 88 \\
Bob & 30 & 92 \\ \hline
\end{tabular}
```

Column Specifiers

l / c / r	Left / center / right aligned
 	Vertical line between columns
p{3cm}	Paragraph column (fixed width)
\hline	Horizontal line
\cline{2-3}	Partial horizontal line (cols 2-3)

Figures

Including Images

```
\usepackage{graphicx} % in preamble
\begin{figure}[htbp]
\centering
\includegraphics[width=0.8\textwidth]{img.png}
\caption{A figure caption}
\label{fig:example}
\end{figure}
```

Placement Specifiers

h	Here (approximately)
t	Top of page
b	Bottom of page
p	Special float page
!	Override internal restrictions
H	Exactly here (requires float)

Cross-references

```
See Figure-\ref{fig:example} on
page-\pageref{fig:example}.
% Requires two compilations to resolve
```

Bibliography

BibTeX Workflow

```
% In .bib file:
@article{smith2025,
author = {Smith, John},
title = {A Great Paper},
journal = {Nature}, year = {2025}
}
```

Citing in Document

```
According to-\cite{smith2025} ...
\bibliographystyle{plain}
\bibliography{refs} % refs.bib
```

Bibliography Styles

plain	Numbered, sorted alphabetically
unsrt	Numbered, in citation order
abbrv	Like plain, abbreviated names
apalike	Author-year (APA-like)

Packages

Essential Packages

amsmath	Advanced math environments
graphicx	Image inclusion
hyperref	Clickable links and references
geometry	Page margins: $\{ \usepackage[margin=1in]{geometry} \}$
booktabs	Professional tables ($\{ \toprule, \midrule \}$)
xcolor	Text and background colors
listings	Source code listings
tikz	Programmatic graphics and diagrams
babel	Multilingual support
natbib	Flexible citations (author-year, numeric)

Custom Commands

New Commands

```
\newcommand{\R}{\mathbb{R}} % shortcut
\newcommand{\norm}[1]{\|#1\|} % 1 argument
Now use:  $\$x \in \mathbb{R}, \|\norm{v}\|$ 
```

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Renewing & Environments

```
\renewcommand{\abstractname}{Summary}
\newenvironment{boxed}
  {\begin{center}\begin{tabular}{|p{0.9\textwidth}|}\hline
  {\hline\end{tabular}\end{center}}
```

Useful Shortcuts

```
\newcommand{\pd}[2]{\frac{\partial #1}{\partial #2}}
\newcommand{\dd}[2]{\frac{d #1}{d #2}}
% Usage: $\pd{f}{x}$, $\dd{y}{t}$
```

Common Patterns

Title Page

```
\begin{document}
\maketitle
\tableofcontents
\newpage
```

Compilation

pdflatex doc.tex	Compile to PDF
bibtex doc	Process bibliography
latexmk -pdf doc.tex	Auto-compile (handles reruns)
xelatex doc.tex	Unicode/custom fonts support

Special Characters

\% \& \# _	Escaped reserved characters
\textbackslash	Backslash in text
\{ \}	Literal braces
``text''	Smart double quotes
---	Em dash
--	En dash

Useful Tips

\label{} + \ref{} 	Cross-reference anything
\input{file}	Include another .tex file
% comment	Single-line comment
\usepackage{lipsum}	Dummy text: \lipsum[1-3]