

# LaTeX Quick Reference

Document structure, math, tables, figures, and more

## Document Structure

### Minimal Document

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

### Document Classes

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

### Preamble

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

### Sectioning

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

## Text Formatting

### Font Styles

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

### Font Sizes

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

### Spacing & Breaks

<b>\\</b>	Line break
<b>\newpage</b>	Page break
<b>\vspace{1cm}</b>	Vertical space
<b>\hspace{1cm}</b>	Horizontal space
<b>\noindent</b>	Suppress paragraph indent
<b>~</b>	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

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

## Greek Letters

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

## Matrices

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

## Environments

### Common Environments

<b>document</b>	Main content area
<b>equation</b>	Numbered math equation
<b>align</b>	Aligned multi-line equations
<b>figure</b>	Floating figure
<b>table</b>	Floating table
<b>verbatim</b>	Literal text (no formatting)
<b>abstract</b>	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

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

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

### 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

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

## Packages

### Essential Packages

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

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

### Special Characters

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

### Useful Tips

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