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: \[ \int_0^\infty e^{-x} dx = 1 \]
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}{|l|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: $x \in \R$, $\norm{v}$
```

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]`