

## LaTeX Cheatsheet

A comprehensive reference for academic writing — document structure, math, figures, tables, and bibliography.

### DOCUMENT SKELETON

```
\documentclass[11pt,a4paper]{article}
\usepackage[utf8]{inputenc}
\usepackage[T1]{fontenc}
\usepackage{amsmath, amssymb, amsthm}
\usepackage{graphicx}
\usepackage{hyperref}
\usepackage[margin=1in]{geometry}
\usepackage{cite}

\title{Title}
\author{Author \ \ Affiliation}
\date{\today}

\begin{document}
\maketitle
\begin{abstract} ... \end{abstract}
\section{Introduction}
\bibliographystyle{plain}
\bibliography{refs}
\end{document}
```

### DOCUMENT CLASSES

CLASS	USE FOR
article	Papers, short reports
report	Theses, multi-chapter docs
book	Books with parts
beamer	Slide presentations
letter	Formal letters
IEEEtran	IEEE journal submissions

### SECTIONING

\part{}	Top-level grouping
\chapter{}	Chapter (book/report)
\section{}	Section
\subsection{}	Subsection
\subsubsection{}	Sub-subsection
\paragraph{}	Run-in heading
\section*{}	Unnumbered variant

### TEXT FORMATTING

\textbf{bold}	<b>bold</b>
\textit{italic}	<i>italic</i>
\emph{emphasized}	context-sensitive emphasis
\texttt{mono}	typewriter
\textsc{Caps}	small caps
\underline{}	underline
{\large ...}	size: tiny → Huge

### MATH MODE

#### INLINE VS DISPLAY

$E = mc^2$  →  $E = mc^2$   
 $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

SYMBOL	CODE
$\alpha \beta \gamma \delta$	\alpha \beta \gamma \delta
$\sum \prod \int \oint$	\sum \prod \int \oint
$\partial \nabla \infty$	\partial \nabla \infty
$\leq \geq \approx$	\leq \geq \approx
$\subset \in \cup \cap$	\subset \in \cup \cap
$\rightarrow \mapsto \Rightarrow$	\to \mapsto \Rightarrow
$\hat{x} \bar{x} \tilde{x} \vec{x}$	\hat \bar \tilde \vec
$\mathbb{R} \mathbb{L} \mathbb{g}$	\mathbb \mathcal \mathfrak

### COMMON CONSTRUCTS

\frac{a}{b}	$\frac{a}{b}$
\sqrt[n]{x}	$\sqrt[n]{x}$
$x^n, x_i$	$x^n, x_i$
\sum_{i=1}^n	$\sum_{i=1}^n$
\int_a^b	$\int_a^b$
\binom{n}{k}	$\binom{n}{k}$
\lim_{x \rightarrow 0}	$\lim_{x \rightarrow 0}$

## EQUATION ENVIRONMENTS

```
% Numbered single equation
\begin{equation}
  f(x) = \int_0^x e^{-t^2} dt
\end{equation}

% Multi-line aligned at &
\begin{align}
  (a+b)^2 &= a^2 + 2ab + b^2 \\
  (a-b)^2 &= a^2 - 2ab + b^2
\end{align}

% Cases
f(x) = \begin{cases}
  x^2 & x \geq 0 \\
  -x & x < 0
\end{cases}

% Matrix
\begin{pmatrix} a & b \\ c & d \end{pmatrix}
```

## THEOREMS & PROOFS

```
\newtheorem{theorem}{Theorem}
\newtheorem{lemma}[theorem]{Lemma}
\theoremstyle{definition}
\newtheorem{definition}{Definition}

\begin{theorem}[Pythagoras]
  $a^2 + b^2 = c^2$.
\end{theorem}

\begin{proof}
  ...
\end{proof}
```

## LISTS

```
\begin{itemize}
  \item Bulleted item
\end{itemize}

\begin{enumerate}
  \item Numbered item
\end{enumerate}

\begin{description}
  \item[Term] definition
\end{description}
```

## FIGURES

```
\begin{figure}[!htbp]
  \centering
  \includegraphics[width=0.7\linewidth]{plot.pdf}
  \caption{Caption goes here.}
  \label{fig:plot}
\end{figure}

% Reference: see Figure~\ref{fig:plot}
```

**Placement:** h = here, t = top, b = bottom, p = float page,  
! = override LaTeX preferences.

## TABLES

```
\begin{table}[!htbp]
  \centering
  \begin{tabular}{l c r}
    \hline
    Method & Acc. & Time \\
    \hline
    Baseline & 0.82 & 12s \\
    Ours & \textbf{0.91} & 8s
  \end{tabular}
  \caption{Results.}
  \label{tab:results}
\end{table}
```

**Columns:** l left, c center, r right, p{3cm} wrapped, | vertical rule. Use booktabs with \toprule \midrule \bottomrule for publication-quality tables.

## CITATIONS & BIBLIOGRAPHY

```
% In preamble
\usepackage{natbib} % or biblatex

% In text
\cite{smith2020} % [1]
\citep{smith2020} % (Smith, 2020)
\citet{smith2020} % Smith (2020)
\cite[p.~42]{smith2020} % with page

% refs.bib
@article{smith2020,
  author = {Smith, J.},
  title = {Paper Title},
  journal= {J. of Things},
  year = {2020},
  volume = {12},
  pages = {1--20}
}
```

## CROSS-REFERENCES

<code>\label{eq:foo}</code>	Place anchor
<code>\ref{eq:foo}</code>	Number only
<code>\eqref{eq:foo}</code>	(n) for equations
<code>\pageref{}</code>	Page number
<code>\autoref{}</code>	"Figure 3" (hyperref)

**Convention:** prefix labels by type — fig: , tab: , eq: , sec: , thm: .

## SPACING & BREAKS

<code>\</code> or <code>\newline</code>	Line break
<code>\par</code> or blank line	New paragraph
<code>\newpage</code> / <code>\clearpage</code>	Force new page
<code>\quad</code> <code>\qquad</code>	Horizontal space
<code>\vspace{1em}</code>	Vertical space
<code>~</code>	Non-breaking space
<code>\noindent</code>	Suppress paragraph indent

## SPECIAL CHARACTERS

Reserved: `&` `%` `$` `#` `_` `{` `}` `~` `^` `\` → escape with `\` (or `\textbackslash`, `\textasciitilde`, `\textasciicircum`).

**Quotes:** ``word'` → "word" · **Dashes:** `-` hyphen, `--` en-dash, `---` em-dash · **Ellipsis:** `\ldots`

## HYPERREF & LINKS

```
\usepackage[
  colorlinks=true,
  linkcolor=blue,
  citecolor=blue,
  urlcolor=blue
]{hyperref}

\href{https://trybibby.com}{Bibby AI}
\url{https://trybibby.com}
```

## COMPILATION PIPELINE

### STANDARD PIPELINE (WITH BIBLIOGRAPHY):

```
pdflatex paper.tex
bibtex paper (or biber for biblatex)
pdflatex paper.tex (resolve refs)
pdflatex paper.tex (finalize)
```

**Modern alternative:** `latexmk -pdf paper.tex` handles all passes automatically.

## QUICK DIAGNOSTICS

ERROR	LIKELY CAUSE
Undefined control sequence	Missing <code>\usepackage</code> or typo
Missing \$ inserted	Math symbol used in text mode
Overfull \hbox	Long word/URL — use <code>\sloppy</code> or <code>microtype</code>
Reference undefined	Recompile (refs need 2 passes)
File ended while scanning	Unclosed <code>{</code> or environment