

How To Write Mathematical Equations, Expressions, and Symbols with LaTeX: A cheatsheet.

[Authorea Help](#)

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1 What is LaTeX?

LaTeX is a programming language that can be used for writing and typesetting documents. It is especially useful to write mathematical notation such as equations and formulae.

2 How to use LaTeX to write mathematical notation

There are three ways to enter "math mode" and present a mathematical expression in LaTeX:

1. *inline* (in the middle of a text line)
2. as an *equation*, on a separate dedicated line
3. as a full-sized inline expression (*displaystyle*)

2.1 *inline*

Inline expressions occur in the middle of a sentence. To produce an inline expression, place the math expression between dollar signs ($\$$). For example, typing $\$E=mc^2\$$ yields $E = mc^2$.

2.2 *equation*

Equations are mathematical expressions that are given their own line and are centered on the page. These are usually used for important equations that deserve to be showcased on their own line or for large equations that cannot fit inline. To produce an inline expression, place the mathematical expression between the symbols $\[$ and $\]$. Typing $\[x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}\]$ yields

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

2.3 *displaystyle*

To get full-sized inline mathematical expressions use \displaystyle . Typing I want this $\$\displaystyle \sum_{n=1}^{\infty} \frac{1}{n}\$$, not this $\$\sum_{n=1}^{\infty} \frac{1}{n}\$$. yields: I want this $\sum_{n=1}^{\infty} \frac{1}{n}$, not this $\sum_{n=1}^{\infty} \frac{1}{n}$.

3 Symbols (in *math* mode)

3.1 The basics

As discussed above math mode in LaTeX happens inside the dollar signs (\dots), inside the square brackets $\left[\dots \right]$ and inside `equation` and `displaystyle` environments. Here's a cheatsheet showing what is possible in a math environment:

<i>description</i>	<i>command</i>	<i>output</i>
addition	<code>+</code>	$+$
subtraction	<code>-</code>	$-$
plus or minus	<code>\pm</code>	\pm
multiplication (times)	<code>\times</code>	\times
multiplication (dot)	<code>\cdot</code>	\cdot
division symbol	<code>\div</code>	\div
division (slash)	<code>/</code>	$/$
simple text	<code>\text{text}</code>	text
infinity	<code>\infty</code>	∞
dots	<code>1,2,3,\ldots</code>	$1, 2, 3, \dots$
dots	<code>1+2+3+\cdots</code>	$1 + 2 + 3 + \dots$
fraction	<code>\frac{a}{b}</code>	$\frac{a}{b}$
square root	<code>\sqrt{x}</code>	\sqrt{x}
<i>n</i> th root	<code>\sqrt[n]{x}</code>	$\sqrt[n]{x}$
exponentiation	<code>a^b</code>	a^b
subscript	<code>a_b</code>	a_b
absolute value	<code> x </code>	$ x $
natural log	<code>\ln(x)</code>	$\ln(x)$
logarithms	<code>\log_a b</code>	$\log_a b$
exponential function	<code>e^x=\exp(x)</code>	$e^x = \exp(x)$
deg	<code>\deg(f)</code>	$\deg(f)$
degree	<code>\degree</code>	
arcmin	<code>\prime</code>	$'$
arcsec	<code>\prime\prime</code>	$''$
circle plus	<code>\oplus</code>	\oplus
circle times	<code>\otimes</code>	\otimes
equal	<code>=</code>	$=$
not equal	<code>\neq</code>	\neq
less than	<code><</code>	$<$
less than or equal to	<code>\leq</code>	\leq
greater than or equal to	<code>\geq</code>	\geq
approximately equal to	<code>\approx</code>	\approx

3.2 Functions

<i>description</i>	<i>command</i>	<i>output</i>
maps to	<code>\to</code>	\rightarrow
composition	<code>\circ</code>	\circ

3.3 Greek and Hebrew letters

<i>command</i>	<i>output</i>	<i>command</i>	<i>output</i>
<code>\alpha</code>	α	<code>\tau</code>	τ
<code>\beta</code>	β	<code>\theta</code>	θ
<code>\chi</code>	χ	<code>\upsilon</code>	υ
<code>\delta</code>	δ	<code>\xi</code>	ξ
<code>\epsilon</code>	ϵ	<code>\zeta</code>	ζ
<code>\varepsilon</code>	ε	<code>\Delta</code>	Δ
<code>\eta</code>	η	<code>\Gamma</code>	Γ
<code>\gamma</code>	γ	<code>\Lambda</code>	Λ
<code>\iota</code>	ι	<code>\Omega</code>	Ω
<code>\kappa</code>	κ	<code>\Phi</code>	Φ
<code>\lambda</code>	λ	<code>\Pi</code>	Π
<code>\mu</code>	μ	<code>\Psi</code>	Ψ
<code>\nu</code>	ν	<code>\Sigma</code>	Σ
<code>\omega</code>	ω	<code>\Theta</code>	Θ
<code>\phi</code>	ϕ	<code>\Upsilon</code>	Υ
<code>\varphi</code>	φ	<code>\Xi</code>	Ξ
<code>\pi</code>	π	<code>\aleph</code>	\aleph
<code>\psi</code>	ψ	<code>\beth</code>	\beth
<code>\rho</code>	ρ	<code>\daleth</code>	\daleth
<code>\sigma</code>	σ	<code>\gimel</code>	\gimel

3.4 Vectors

<i>description</i>	<i>command</i>	<i>output</i>
vector	<code>\vec{v}</code>	\vec{v}
vector	<code>\mathbf{v}</code>	\mathbf{v}
norm	<code> \vec{v} </code>	$ \vec{v} $

3.5 Set theory

<i>description</i>	<i>command</i>	<i>output</i>
set brackets	<code>\{1,2,3\}</code>	$\{1, 2, 3\}$
element of	<code>\in</code>	\in
subset of	<code>\subset</code>	\subset
subset of	<code>\subseteq</code>	\subseteq
contains	<code>\supset</code>	\supset
contains	<code>\supseteq</code>	\supseteq
union	<code>\cup</code>	\cup
intersection	<code>\cap</code>	\cap
big union	<code>\bigcup_{n=1}^{10}A_n</code>	$\bigcup_{n=1}^{10} A_n$
big intersection	<code>\bigcap_{n=1}^{10}A_n</code>	$\bigcap_{n=1}^{10} A_n$
empty set	<code>\emptyset</code>	\emptyset
power set	<code>\mathcal{P}</code>	\mathcal{P}
minimum	<code>\min</code>	min
maximum	<code>\max</code>	max
supremum	<code>\sup</code>	sup
infimum	<code>\inf</code>	inf
limit superior	<code>\limsup</code>	lim sup
limit inferior	<code>\liminf</code>	lim inf
closure	<code>\overline{A}</code>	\overline{A}

3.6 Logic

<i>description</i>	<i>command</i>	<i>output</i>
not	<code>\sim</code>	\sim
and	<code>\land</code>	\wedge
or	<code>\lor</code>	\vee
if...then	<code>\to</code>	\rightarrow
if and only if	<code>\leftrightarrow</code>	\leftrightarrow
logical equivalence	<code>\equiv</code>	\equiv
therefore	<code>\therefore</code>	\therefore
there exists	<code>\exists</code>	\exists
for all	<code>\forall</code>	\forall
implies	<code>\Rightarrow</code>	\Rightarrow
equivalent	<code>\Leftrightarrow</code>	\Leftrightarrow

3.7 Calculus

<i>description</i>	<i>command</i>	<i>output</i>
derivative	<code>\frac{df}{dx}</code>	$\frac{df}{dx}$
derivative	<code>\f'</code>	f'
partial derivative	<code>\frac{\partial f}{\partial x}</code>	$\frac{\partial f}{\partial x}$
limits	<code>\lim_{x \to \infty}</code>	$\lim_{x \rightarrow \infty}$
summation	<code>\sum_{n=1}^{\infty} a_n</code>	$\sum_{n=1}^{\infty} a_n$
product	<code>\prod_{n=1}^{\infty} a_n</code>	$\prod_{n=1}^{\infty} a_n$
integral	<code>\int</code>	\int
double integral	<code>\iint</code>	\iint
triple integral	<code>\iiint</code>	\iiint

3.8 Number theory

<i>description</i>	<i>command</i>	<i>output</i>
divides	<code> </code>	$ $
does not divide	<code>\not </code>	\nmid
greatest common divisor	<code>\gcd</code>	\gcd
ceiling	<code>\lceil x \rceil</code>	$\lceil x \rceil$
floor	<code>\lfloor x \rfloor</code>	$\lfloor x \rfloor$

3.9 Geometry and trigonometry

<i>description</i>	<i>command</i>	<i>output</i>
angle	<code>\angle ABC</code>	$\angle ABC$
degree	<code>90^{\circ}</code>	90°
triangle	<code>\triangle ABC</code>	$\triangle ABC$
segment	<code>\overline{AB}</code>	\overline{AB}
sine	<code>\sin</code>	\sin
cosine	<code>\cos</code>	\cos
tangent	<code>\tan</code>	\tan
cotangent	<code>\cot</code>	\cot
secant	<code>\sec</code>	\sec
cosecant	<code>\csc</code>	\csc
inverse sine	<code>\arcsin</code>	\arcsin
inverse cosine	<code>\arccos</code>	\arccos
inverse tangent	<code>\arctan</code>	\arctan

4 Symbols (in *text* mode)

The followign symbols do **not** have to be surrounded by dollar signs.

<i>description</i>	<i>command</i>	<i>output</i>
dollar sign	<code>\\$</code>	\$
percent	<code>\%</code>	%
ampersand	<code>\&</code>	&
pound	<code>\#</code>	#
backslash	<code>\textbackslash</code>	\
left quote marks	<code>‘ ‘</code>	“
right quote marks	<code>’ ’</code>	”
single left quote	<code>‘</code>	‘
single right quote	<code>’</code>	’
hyphen	<code>X-ray</code>	X-ray
en-dash	<code>pp. 5--15</code>	pp. 5–15
em-dash	<code>Yes---or no?</code>	Yes—or no?

5 Writing LaTeX notation in Authorea

Authorea supports LaTeX writing, but you don’t have to know LaTeX to use Authorea! In order to insert LaTeX in an Authorea document:

1. [Create a new document](#)
2. Click on the **Insert** button in the toolbar and then select **LaTeX** from the dropdown.

Here are some tips for writing LaTeX in Authorea:

1. Click anywhere outside of the LaTeX block to render it.
2. Hover on Preview to see a Preview of the rendered content.
3. Do not paste an entire LaTeX article! Instead import documents from your homepage.
4. Only type LaTeX content in a LaTeX block, i.e. everything you would write after `\begin{document}`.
5. Do not type preamble (e.g. `documentclass`), `frontmatter`, macros or figures.
6. To add macros (newcommands) and packages, click Settings → Edit Macros
7. Use the Insert Figure button to insert images (and data).
8. Use math mode for equations, e.g. $\mathcal{L}_{EM} = -\frac{1}{4}F^{\mu\nu}F_{\mu\nu}$.
9. Try the citation tool (click cite) to find and add citations, or use `\cite{}`.
10. To insert more LaTeX blocks click Insert → LaTeX.
11. You can use sectioning commands like `\section{}`, `\subsection{}`, `\subsubsection{}` to add headings.¹

6 Further reading

Interested in finding out more about LaTeX? Check out [these examples](#) of how LaTeX can be used to write mathematical equations, and [follow these instructions](#) to create powerful documents in LaTeX on Authorea, beyond mathematics.

¹You can toggle heading numbering on/off from the article settings. This footnote is generated via ² |