



MathJax basic tutorial and quick reference

Asked 8 years, 9 months ago Active 16 days ago Viewed 1.2m times

(Deutsch: [MathJax: LaTeX Basic Tutorial und Referenz](#))

3454



3166



1. To see how any formula was written in any question or answer, including this one, right-click on the expression and choose "Show Math As > TeX Commands". (When you do this, the '\$' will not display. Make sure you add these. See the next point. There are also [other possibilities](#) how to view the code for the formula or the whole post.)

2. **For inline formulas, enclose the formula in $\$ \dots \$$. For displayed formulas, use $\$ \$ \dots \$ \$$.**

These render differently. For example, type

$\$ \sum_{i=0}^n i^2 = \frac{(n^2+n)(2n+1)}{6} \$$

to show $\sum_{i=0}^n i^2 = \frac{(n^2+n)(2n+1)}{6}$ (which is inline mode) or type

$\$ \$ \sum_{i=0}^n i^2 = \frac{(n^2+n)(2n+1)}{6} \$ \$$

to show

$$\sum_{i=0}^n i^2 = \frac{(n^2 + n)(2n + 1)}{6}$$

(which is display mode).

3. For **Greek letters**, use $\backslash alpha$, $\backslash beta$, ..., $\backslash omega$: $\alpha, \beta, \dots, \omega$. For uppercase, use $\backslash Gamma$, $\backslash Delta$, ..., $\backslash Omega$: $\Gamma, \Delta, \dots, \Omega$. Some Greek letters have variant forms: $\backslash epsilon$ $\backslash varepsilon$ ϵ, ε , $\backslash phi$ $\backslash varphi$ ϕ, φ , and others.

4. For **superscripts and subscripts**, use \wedge and $_$. For example, $x_{i^2} : x_i^2$, $\log_2 x$:

5. **Groups.** Superscripts, subscripts, and other operations apply only to the next “group”. A “group” is either a single symbol, or any formula surrounded by curly braces $\{ \dots \}$. If you do 10^{10} , you will get a surprise: 10^10 . But $10^{\{10\}}$ gives what you probably wanted: 10^{10} . Use curly braces to delimit a formula to which a superscript or subscript applies: x^5^6 is an error; $\{x^y\}^z$ is x^{y^z} , and $x^{\{y^z\}}$ is x^{y^z} . Observe the difference between x_{i^2} x_i^2 and $x_{\{i^2\}}$ x_{i^2} .

6. **Parentheses** Ordinary symbols $()[]$ make parentheses and brackets $(2 + 3)[4 + 4]$. Use $\{$ and $\}$ for curly braces $\{ \}$.

These do *not* scale with the formula in between, so if you write $(\frac{\sqrt{x}}{y^3})$ the parentheses will be too small: $(\frac{\sqrt{x}}{y^3})$. Using $\left(\dots \right)$ will make the sizes adjust automatically to the formula they enclose: $\left(\frac{\sqrt{x}}{y^3} \right)$ is $\left(\frac{\sqrt{x}}{y^3} \right)$.

\left and \right apply to all the following sorts of parentheses: $($ and $)$ (x) , $[$ and $]$ $[x]$, $\{$ and $\}$ $\{x\}$, $|$ $|x|$, $\|$ $\|x\|$, \angle and \angle $\langle x \rangle$, \lceil and \rceil $\lceil x \rceil$, and \lfloor and \rfloor $\lfloor x \rfloor$. \middle can be used to add additional dividers. There are also invisible parentheses, denoted by \cdot : $\left. \frac{1}{2} \right\rbrace$ is $\frac{1}{2}$.

superscript is the upper limit, so for example \sum_1^n . Don't forget $\{ \dots \}$ if the limits are more than a single symbol. For example, $\sum_{i=0}^{\infty} i^2$. Similarly, \prod , \int , \bigcup , \bigcap , \iint , \iiint , \idotsint , $\int \dots \int$.

8. **Fractions** There are [three ways to make these](#). $\frac{a}{b}$ applies to the next two groups, and produces $\frac{a}{b}$; for more complicated numerators and denominators use $\{ \dots \}$: $\frac{a+1}{b+1}$ is $\frac{a+1}{b+1}$. If the numerator and denominator are complicated, you may prefer $\overline{\hspace{1cm}}$, which splits up the group that it is in: $\frac{a+1}{b+1}$ is $\frac{a+1}{b+1}$. Using $\cfrac{a}{b}$ command is useful for continued fractions $\frac{a}{b}$, more details for which [are given in this sub-article](#).

9. Fonts

- Use $\mathbb{}$ or Bbb for "blackboard bold": $\mathbb{C}\mathbb{H}\mathbb{N}\mathbb{Q}\mathbb{R}\mathbb{Z}$.
- Use $\mathbf{}$ for boldface: **ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz**.
 - For expression based characters, use $\boldsymbol{\alpha}$ instead: $\boldsymbol{\alpha}$
- Use $\mathit{}$ for italics: *ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz*.
- Use $\textbf{}$ for boldfaced italics: ***ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz***.
- Use $\texttt{}$ for "typewriter" font: **ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz**.
- Use rm for roman font: **ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz**.
- Use $\textsf{}$ for sans-serif font: **ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz**.
- Use cal for "calligraphic" letters: *ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz*
- Use scr for script letters: *A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
abcdefghijklmnopqrstuvwxyz*
- Use frak for "Fraktur" (old German style) letters:

Nonstandard function names can be set with `\operatorname{foo}(x)` $\operatorname{foo}(x)$.

12. There are a very large number of **special symbols and notations**, too many to list here; see [this shorter listing](#), or [this exhaustive listing](#). Some of the most common include:

- `\lt \gt \le \leq \leqq \leqslant \ge \geq \geqq \geqslant \neq` $<, >, \leq, \leq, \leq, \leq, \geq, \geq, \geq, \geq, \neq$. You can use `\not` to put a slash through almost anything: `\not\lt` \nless but it often looks bad.
- `\times \div \pm \mp \cdot` $\times, \div, \pm, \mp, \cdot$ `\cdot` is a centered dot: $x \cdot y$
- `\cup \cap \setminus \subset \subseteq \supset \supseteq \in \notin \emptyset`
`\varnothing` $\cup, \cap, \setminus, \subset, \subseteq, \supset, \supseteq, \in, \notin, \emptyset, \varnothing$
- `\choose` or `\binom` $\binom{n+1}{2k}$
- `\to \rightarrow \leftarrow \mapsto` $\rightarrow, \rightarrow, \leftarrow, \Rightarrow, \Leftarrow, \mapsto$
- `\land \lor \lnot \forall \exists \top \bot \vdash \dashv` $\wedge, \vee, \neg, \forall, \exists, \top, \bot, \vdash, \dashv$
- `\star \ast \oplus \circ \bullet`
- `\approx \sim \simeq \cong \equiv \prec \succ \dots`
- `\infty \aleph_0 \aleph_n \nabla \partial \Im \Re \mathfrak{I} \mathfrak{R}`
- For modular equivalence, use `\pmod` like this: $a \equiv b \pmod n$
- For the binary mod operator, use `\bmod` like this: $a \bmod 17$
- Avoid using `\mod`, as it produces extra space: compare the above with $a \mod 17$
- `\ldots` is the dots in a_1, a_2, \dots, a_n `\cdots` is the dots in $a_1 + a_2 + \cdots + a_n$
- Script lowercase l is `\ell` ℓ .

[Detexify](#) lets you draw a symbol on a web page and then lists the TeX symbols that seem to resemble it. These are not guaranteed to work in MathJax but are a good place to start. To check that a command is supported, note that MathJax.org maintains a [list of currently](#)

`\\$` \$, `\{` {, `_` —, etc. If you want `\` itself, you should use `\backslash` (symbol) or `\setminus` ([binary operation](#)) for `\`, because `\\` is for a new line.











(Tutorial ends here.)

It is important that this note be reasonably short and not suffer from too much bloat. To include more topics, please create short addenda and post them as answers instead of inserting them into this post.

Contents

Alphabetical list of links to To MathJax Topics, by title:

- [Absolute values and norms](#) • [Additional symbolic decorations](#) • [Aligning Equations](#)
- [Alternative Ways of Writing in LaTeX](#) • [Annotations of reasoning](#) • [Arbitrary operators](#)
- [Arrays](#) • [Big braces](#) • [Colors](#)
- [Commutative diagrams](#) • [Continued fractions](#) • [Crossing things out](#)
- [Definitions by cases \(piecewise functions\)](#) • [Degree symbol](#) • [Display style](#)
- [Equation numbering](#) • [Fussy spacing issues](#) • [Highlighting expressions](#)
- [Left and right arrows](#) • [Limits](#) • [Linear programming](#)
- [Long division](#) • [Math Programming](#) • [Matrices](#)
- [Markov Chains](#) • [Mixing code and MathJax formatting on lines](#) • [The `\newcommand` function](#)

-
- 31  Some capital Greek letters are the same as the Roman equivalents, so they are not separated in TeX . For a capital beta, one must use something like `\mathrm{B}` : B – [robjohn](#) ♦ Aug 28 '12 at 2:06
-
- 10  Two related questions: [How do I insert a table when asking a question?](#) and [How to show the integral symbol on this site?](#) – [Martin Sleziak](#) Aug 28 '12 at 13:26
-
- 32  A quick addition to point 11: If you want to use a sin-like symbol that is not already defined, the command is `\operatorname` : e.g., `\operatorname{Spec}` A gives $\operatorname{Spec} A$. – [Charles Staats](#) Aug 28 '12 at 16:45 
-
- 21  It might be useful to mention hanging subscripts for things like ${}_5C_3$. You could also mention `\frac` vs `\dfrac` . – [axblount](#) Aug 29 '12 at 18:09
-
- 7  My basic idea is that if a beginner can express a formula clearly, then someone else can come in and clean up the typesetting afterwards. I am considering getting rid of the section about `\big` , `\left` , and `\right` for this reason, and trimming the section on spacing. – [MJD](#) Aug 30 '12 at 2:06
-
- 9  Most of the references to TeX or LaTeX in this and the answers ought to be to MathJaX (the exception that I can see being the output of Detexify). I know this is a bit pedantic, but would it be alright to correct this? – [Andrew Stacey](#) Sep 11 '12 at 14:13
-
- 5  @AndrewStacey Thanks for pointing this out. Let's by all means be as correct as possible, particularly when there's no extra cost. – [MJD](#) Sep 11 '12 at 14:15
-
- 4  @MJD Okay, I've had a go (also the answer about arrays). I wonder also whether or not it is worth a sentence at the end pointing out that whilst MathJaX does its best to emulate TeX, it isn't TeX and so while knowing how something is done in TeX gives you a starting point, it isn't a guarantee that the same thing works in MathJaX. (As a case in point, questions about MathJaX are generally *off-topic* over on TeX-SX.) – [Andrew Stacey](#) Sep 11 '12 at 14:22
-
- 6  @AndrewStacey I wouldn't. They are close enough that it seems to me to be a needless refinement. I might even argue that MathJax is TeX , although an alternative implementation. We're willing to accept that other programming languages (JavaScript, for example) that have slightly incompatible implementations are nevertheless the same language; why not in this case as well? – [MJD](#) Sep 11 '12 at 14:35
-

- 5 [@AndrewStacey](#) All the tips given here would work in any $\text{L}^{\text{A}}\text{T}_{\text{E}}\text{X} / \text{E}^{\text{X}}\text{T}_{\text{E}}\text{X}$ environment with the proper packages. MathJax is just the service used to render it. You wouldn't say "Miktex tutorial" or "texlive tutorial". – [axblount](#) Sep 11 '12 at 15:01
-
- 6 [@axblount](#) But that's precisely the wrong way around to think about it! The likelihood is that someone will look at this tutorial to figure out how to write something on the Maths-SX site: i.e., to use MathJaX. If they can't find help here, where do they go? If they have the idea that MathJaX is "just a javascript implementation of TeX" then they might think to look for help with TeX, but that is quite possibly *not* going to be helpful. – [Andrew Stacey](#) Sep 11 '12 at 15:08
-
- 9 [@axblount](#) For a start, you've changed the goalposts: "LaTeX **math** expressions". LaTeX is so much more than just a way of typesetting maths! Second, I don't really know but it wouldn't take me long to cook one up. I don't use MathJaX so I haven't explored it. But I know, for example, that it can't handle catcode changes. Which means that I can't make $($ and $)$ *automatically* resizeable. I can in LaTeX. – [Andrew Stacey](#) Sep 11 '12 at 16:04
-
- 78 I wish I saw this post when I first joined. This post should be a main link on the home page. There should be a button under each box: NEW TO LATEX, CLICK HERE FOR EXAMPLES. This is extremely useful, concise. – [user1527227](#) May 31 '13 at 18:09

37 Answers

Active	Oldest	Votes
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1

2

Next

▲ Matrices

399



1. Use `$$\begin{matrix}...\end{matrix}$$` In between the `\begin` and `\end`, put the matrix elements. End each matrix row with `\\`, and separate matrix elements with `&`. For example,

```

$$
\begin{matrix}
1 & x & x^2 \\
1 & y & y^2 \\
1 & z & z^2
\end{matrix}
$$

```

produces:

$$\begin{matrix} 1 & x & x^2 \\ 1 & y & y^2 \\ 1 & z & z^2 \end{matrix}$$

MathJax will adjust the sizes of the rows and columns so that everything fits.

2. To add brackets, either use `\left...\right` as in section 6 of the tutorial, or replace `matrix` with `pmatrix` $\begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$, `bmatrix` $\begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$, `Bmatrix` $\begin{Bmatrix} 1 & 2 \\ 3 & 4 \end{Bmatrix}$, `vmatrix` $\begin{vmatrix} 1 & 2 \\ 3 & 4 \end{vmatrix}$, `Vmatrix` $\begin{Vmatrix} 1 & 2 \\ 3 & 4 \end{Vmatrix}$.

3. Use `\cdots` \cdots `\ddots` \ddots `\vdots` \vdots when you want to omit some of the entries:

$$\begin{pmatrix} 1 & a_1 & a_1^2 & \cdots & a_1^n \\ 1 & a_2 & a_2^2 & \cdots & a_2^n \\ \vdots & \vdots & \vdots & \ddots & \vdots \\ 1 & a_m & a_m^2 & \cdots & a_m^n \end{pmatrix}$$

4. For horizontally "augmented" matrices, put parentheses or brackets around a suitably-formatted table; see [arrays](#) below for details. Here is an example:

$$\left[\begin{array}{cc|c} 1 & 2 & 3 \\ 4 & 5 & 6 \end{array} \right]$$

is produced by:

```

$$ \left[
\begin{array}{cc|c}
1&2&3\\
4&5&6
\end{array}
\right]

```


$$\left(\begin{array}{cc} a & b \\ c & d \\ \hline 1 & 0 \\ 0 & 1 \end{array}\right)$$

is produced by

```


$$\begin{pmatrix} a & b \\ c & d \\ \hline 1 & 0 \\ 0 & 1 \end{pmatrix}$$


```

6. For small inline matrices use `\bigl(\begin{smallmatrix} ... \end{smallmatrix}\bigr)`,
e.g. $\begin{pmatrix} a & b \\ c & d \end{pmatrix}$ is produced by:

```
\bigl(\begin{smallmatrix} a & b \\ c & d \end{smallmatrix}\bigr)
```

Share Edit Follow Flag

edited Nov 19 '17 at 19:15



ziggurism

14.7k 10 12

answered Aug 28 '12 at 4:17



MJD

59.5k 8 40 60

-
- 22 This says "End each matrix row with `\\`". But there is no reason to end the LAST row of the matrix that way. The double backslash means: now go on to the next row. But there isn't any next row after the last one. – **Michael Hardy** Aug 28 '14 at 5:15
-
- 4 I can't edit, but that could be phrased "Separate matrix rows with `\\`". – **trichoplax** Nov 18 '16 at 9:43
-
- 4 @MichaelHardy but a `\\` on every line is harmless, and it makes the editing of matrices easier because swapping with the last line can be done with one quick keystroke in many editors. – **Reb.Cabin** Feb 8 '18 at 15:18
-

|

Symbols

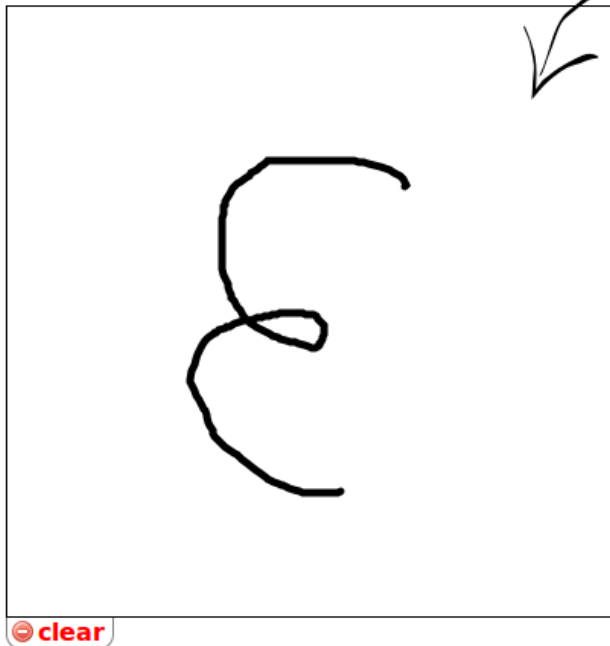
286

In general, you have to search in long tables about a specific symbol you're looking for, things like Ψ , δ , ζ , \geq , \subseteq ... And it turns out that this operation can be frustrating and time consuming, which can cause the buddy to abandon writing the complete $LATEX$ sentence in his answer, or in some cases, the complete answer itself.

That's why the tool that I will present you in this post was conceived. Basically, it is a $LATEX$ *handwritten symbol recognition*. Example in image:

Detexify² - LaTeX symbol classifier

[classify](#) [symbols](#) [blog](#)



Did this help?

Hosting Detexify costs money and if it helps you may consider helping to pay the hosting bill.

 \mathcal{E}

Score: 0.0732728422365059

`\usepackage{ amssymb }`
`\mathcal{E}`
mathmode

 ε

Score: 0.0840035071153649

`\varepsilon`
mathmode

 epsilon

Score: 0.0939626071446543

`\usepackage{ tipa }`
`\textepsilon`
textmode






Score: 0.0948022041085201

Here is the website: [Detexify²](#) No more frustration.

Share Edit Follow Flag

answered Oct 14 '13 at 20:15

community wiki
[user93957](#)

-
- 4  How to implement `usepackage` ? I'd like to have `\iddots` from package `mathdots` available. – [Gottfried Helms](#) Jun 15 '16 at 11:05 
-
- 1  @GottfriedHelms see [this question](#) - I think the answer is "you can't do that"... – [Floris](#) Jun 27 '17 at 22:40
-
- 1  It recognized my horrible drawing with a finger on my notebook's mousepad! Unfortunately the symbol it recognized (`mapsfrom`) isn't part of MathJax – [Manfred Weis](#) Oct 24 '19 at 5:55 
-

|

▲ Aligned equations

283



Often people want a series of equations where the equals signs are aligned. To get this, use `\begin{align}...\end{align}`. Each line should end with `\\`, and should contain an ampersand at the point to align at, typically immediately before the equals sign.

For example,

$$\begin{aligned}\sqrt{37} &= \sqrt{\frac{73^2 - 1}{12^2}} \\ &= \sqrt{\frac{73^2}{12^2} \cdot \frac{73^2 - 1}{73^2}} \\ &= \sqrt{\frac{73^2}{12^2}} \sqrt{\frac{73^2 - 1}{73^2}} \\ &= \frac{73}{12} \sqrt{1 - \frac{1}{73^2}} \\ &\approx \frac{73}{12} \left(1 - \frac{1}{2 \cdot 73^2} \right)\end{aligned}$$

is produced by

```
\begin{align}
\sqrt{37} &= \sqrt{\frac{73^2-1}{12^2}} \\
&= \sqrt{\frac{73^2}{12^2}\cdot\frac{73^2-1}{73^2}} \\
&= \sqrt{\frac{73^2}{12^2}}\sqrt{\frac{73^2-1}{73^2}} \\
&= \frac{73}{12}\sqrt{1 - \frac{1}{73^2}} \\
&\approx \frac{73}{12}\left(1 - \frac{1}{2\cdot 73^2}\right)
\end{align}
```

The usual `$$` marks that delimit the display may be omitted here.

Share Edit Follow Flag

edited Apr 22 '15 at 7:36

answered Aug 28 '12 at 4:28
















MJD

59.5k

8

40

60

-
- 7  The AMS's [Short Math Guide](#) recommends the `align` environment over `eqnarray` in LaTeX. In MathJax the spacing seems to be the same, but `align` requires one less ampersand per line. – user856 Aug 28 '12 at 4:41
-
- 3  Thanks. I was not sure whether to discuss that. [A detailed argument against eqnarray is in this article](#). – MJD Aug 28 '12 at 4:51 
-
- 7  Correct me if I'm wrong, but I don't believe the `$$` is necessary before and after the `\begin{align}`. I've certainly never used it. From experience, the `\begin{align}` puts you into math-display mode by itself. – TravisJ Apr 21 '15 at 12:24 
-
- 7  I sometimes find that one line of this environment is too close to another, making them uncomfortable to read. The interline spacing can be adjusted by using input such as `\[1ex]` instead of `\[`. (And of course the `1` can be changed to another value such as `1.5` or `.7` in order to get enough space but not too much.) – David K Jan 30 '16 at 16:29 
-
- 3  @MJD i put the equation:
- $$\begin{align} f(x) &= \left(x^3\right) + \left(x^3 + x^2 + x^1\right) + \left(x^3 + x^2\right) \\ f(x) &= \left(\left(3x^2\right.\right. \end{align}$$
- but the third `&` is a problem: according to MathJax, it does not go there. then when i remove it, it says that "a missing close brace or unclosed brace" is present. what am i doing wrong? – Alexander Day Apr 26 '17 at 21:25 
-
- 5  @AlexanderDay How did you use that boxed quote? What are commands or formats for it? – Always Confused May 21 '17 at 15:53 
-
- 3  @AlwaysConfused the box delimits a MathJax formula with a syntax error. – Dan Henderson Oct 2 '17 at 13:32
-
- 1  The `align*` variation does two things differently: left-aligns the equations and omits equation numbers; the regular `align` environment centers the equations and puts an equation number on each line, at least in my version of Jupyter notebooks. – Reb.Cabin Feb 6 '18 at 19:24
-

|



Definitions by cases (piecewise functions)

237

Use `\begin{cases}...\end{cases}` . End each case with a `\\` , and use `&` before parts that should be aligned.



For example, you get this:

$$f(n) = \begin{cases} n/2, & \text{if } n \text{ is even} \\ 3n + 1, & \text{if } n \text{ is odd} \end{cases}$$

by writing this:

```
f(n) =
\begin{cases}
n/2, & \& \text{\text{if } $n$ is even} \\
3n+1, & \& \text{\text{if } $n$ is odd} \\
\end{cases}
```

The brace can be moved to the right:

$$\left. \begin{array}{l} \text{if } n \text{ is even: } \\ \text{if } n \text{ is odd: } \end{array} \right\} \begin{array}{l} n/2 \\ 3n + 1 \end{array} = f(n)$$

by writing this:

```
\left.
\begin{array}{l}
\text{\text{if } $n$ is even:}&n/2\\
\text{\text{if } $n$ is odd:}&3n+1
\end{array}
\right\}
=f(n)
```




To get a larger vertical space between cases we can use `\\[2ex]` instead of `\\` . For example, you get this:

$$f(n) = \begin{cases} \frac{n}{2}, & \text{if } n \text{ is even} \\ 3n + 1, & \text{if } n \text{ is odd} \end{cases}$$

by writing this:

```
f(n) =
\begin{cases}
\frac{n}{2}, & \& \text{\text{if } $n$ is even} \\
3n+1, & \& \text{\text{if } $n$ is odd} \\
\end{cases}
```

3,258 0 0 3,258 0 0 0 0

3   @jibs `\displaystyle` is enabled automatically in displays, for example between `$$$`. You should not ever have to use it. – MJD Jul 1 '14 at 14:50 

|

▲ Arrays

- 163 It is often easier to read tables formatted in MathJax rather than plain text or a fixed width font. Arrays and tables are created with the `array` environment. Just after `\begin{array}` the format of each column should be listed, use `c` for a center aligned column, `r` for right aligned, `l` for left aligned and `|` for a vertical line. Just as with matrices, cells are separated with `&` and rows are broken using `\\`. A horizontal line spanning the array can be placed before the current line with `\hline`.

For example,

n	Left	Center	Right
1	0.24	1	125
2	−1	189	−8
3	−20	2000	$1 + 10i$

```


$$\begin{array}{c|lcr}
n & \text{Left} & \text{Center} & \text{Right} \\
\hline
1 & 0.24 & 1 & 125 \\
2 & -1 & 189 & -8 \\
3 & -20 & 2000 & 1+10i
\end{array}$$


```



Arrays can be nested to make an array of tables.


For example,



min	0	1	2	3	max	0	1	2	3
0	0	0	0	0	0	0	1	2	3
1	0	1	1	1	1	1	1	2	3
2	0	1	2	2	2	2	2	2	3
3	0	1	2	3	3	3	3	3	3

Δ	0	1	2	3
0	0	1	2	3
1	1	0	1	2
2	2	1	0	1
3	3	2	1	0

As the source for the preceding array is long, please right-click on one of the tables and choose **Show Math As ► TeX Commands**.

13  You'll have to wrap the contents of each cell in `\text` if you don't want *allitalics, weird – lookingspacing, an' oddapostrophes*. – user856 Aug 29 '12 at 21:30 

2  Thanks! I like your numeric example better, since the widths of the entries are different enough that the alignment differences are visually clear. – MJD Aug 30 '12 at 1:37 

5  [This](#) could also be convenient for some people, althought it destroys the joy of writing tables in *L^AT_EX* by hand! – nullgeppetto Jun 3 '14 at 14:18 

8  **Center Aligned Table Captions with Left Aligned Contents** 

Bad		Better
$e^{i\frac{\pi}{2}}$	$e^{\frac{i\pi}{2}}$	$e^{i\pi/2}$
$\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \sin x \, dx$		$\int_{-\pi/2}^{\pi/2} \sin x \, dx$

– GNUSupporter 8964民主女神 地下教會 Dec 12 '16 at 16:41 

|

▲ Fussy spacing issues

158 These are issues that won't affect the correctness of formulas, but might make them look significantly better or worse. Beginners should feel free to ignore this advice; someone else will correct it for them, or more likely nobody will care.



Don't use `\frac` in exponents or limits of integrals; it looks bad and can be confusing, which is why it is rarely done in professional mathematical typesetting. Write the fraction horizontally, with a slash:

Bad	Better
$e^{i\frac{\pi}{2}}$	$e^{\frac{i\pi}{2}}$
$\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \sin x \, dx$	$\int_{-\pi/2}^{\pi/2} \sin x \, dx$

The `|` symbol has the wrong spacing when it is used as a divider, for example in set comprehensions. Use `\mid` instead:

Bad	Better
$\{x x^2 \in \mathbb{Z}\}$	$\{x \mid x^2 \in \mathbb{Z}\}$

When using stretchable delimiters (i.e. with `\left` and `\right`), it may be preferable to use `\,``\middle|\,`. This produces a stretchable vertical bar with a little bit of space around it. Another alternative is to use a colon instead.




















Bad	Better
$\left\{ \frac{m}{n} \mid m, n \in \mathbb{Z} \right\}$	$\left\{ \frac{m}{n} \middle m, n \in \mathbb{Z} \right\}$

For double and triple integrals, don't use `\int\int` or `\int\int\int`. Instead use the special forms `\iint` and `\iiint`:

Bad	Better
$\int \int_S f(x) \, dy \, dx$	$\iint_S f(x) \, dy \, dx$
$\int \int \int_V f(x) \, dz \, dy \, dx$	$\iiint_V f(x) \, dz \, dy \, dx$

Use `\,` to insert a thin space before differentials; without this $T_{\text{E}}\text{X}$ will mash them together:

Bad	Better
$\int \, dx$	$\int dx$

-
- 3   I think the first adjusted fraction looks better than the original, but I don't like the second. In any case, this minor spacing imbalance is too peripheral to belong in a basic MathJax tutorial IMO. Too likely to scare people away rather than make them feel helped. – [hmakholm left over Monica](#) Aug 31 '12 at 21:05 
-
- 2   @Henning Do you mean that the fraction example is too unimportant even to appear in an addendum on fussy spacing, or that the fussy spacing article is too unimportant to appear as an addendum to the tutorial? – [MJD](#) Aug 31 '12 at 23:57
-
- 2   I was talking specifically about the fraction example. Mostly I'm concerned that somebody will come away thinking, *Eeek! Do I have to worry about THAT to use the site?* But it's also arguable that the disclaimer at the top of the answer ought to take care of that. – [hmakholm left over Monica](#) Sep 1 '12 at 21:13 
-
- 2   @MJD I like the less space, but what if we want to list the bounds for multiple integrals? Like if we have say 3 integrals and we have 3 separate bounds for each how would we list each one? Or do we have to do `\int_bound1^bound2\int_bound3^bound4\int_bound5^bound6??` – [TheHopefulActuary](#) Nov 19 '12 at 19:45
-
- 2   @Kyle I think that's exactly what you do in that case. – [MJD](#) Nov 19 '12 at 20:09
-
- 29   Worth nothing you can use `\middle` with `|` to get it to work with `\left` and `\right`, like `\left\{x\middle|\frac{x^2}{2}\in\mathbb{Z}\right\}` – [asmeurer](#) Jun 9 '13 at 22:49
-
- 1   Thanks very much! I wanted to do that, but didn't know how. – [MJD](#) Jun 10 '13 at 15:47
-
- 1   It seems `\middle \mid` doesn't work. What is the correct way to get the right spacing with automatic vertical resizing? – [asmeurer](#) Apr 26 '18 at 20:05 
-
- |
-

System of equations

116

- Use `\begin{array}...\end{array}` and `\left\{...\right.`. For example, you get this:

$$\begin{cases} a_1x + b_1y + c_1z = d_1 \\ a_2x + b_2y + c_2z = d_2 \\ a_3x + b_3y + c_3z = d_3 \end{cases}$$

by writing this:

```
$$
\left\{
\begin{array}{c}
a_1x+b_1y+c_1z=d_1 \\
a_2x+b_2y+c_2z=d_2 \\
a_3x+b_3y+c_3z=d_3
\end{array}
\right.
$$
```

- Alternatively we can use `\begin{cases}...\end{cases}`. The same system

$$\begin{cases} a_1x + b_1y + c_1z = d_1 \\ a_2x + b_2y + c_2z = d_2 \\ a_3x + b_3y + c_3z = d_3 \end{cases}$$

is produced by the following code

```
$$\begin{cases}
a_1x+b_1y+c_1z=d_1 \\
a_2x+b_2y+c_2z=d_2 \\
a_3x+b_3y+c_3z=d_3
\end{cases}
$$
```

- To align the `=` signs use `\begin{aligned}...\end{aligned}` and `\left\{...\right.` (see asmeurer's comment)

$$\begin{cases} a_1x + b_1y + c_1z = d_1 + e_1 \\ a_2x + b_2y = d_2 \\ a_3x + b_3y + c_3z = d_3 \end{cases}$$

whose code is

```
$$
\left\{
\begin{aligned}
a_1x+b_1y+c_1z &=d_1+e_1 \\
a_2x+b_2y&=d_2
\end{aligned}
\right.
$$
```

$$\begin{cases} a_1x + b_1y + c_1z &= d_1 + e_1 \\ a_2x + b_2y &= d_2 \\ a_3x + b_3y + c_3z &= d_3 \end{cases}$$

use `array` with `l` (for "align **left**"; there are also `c` and `r`) parameters

```


$$\left\{ \begin{array}{ll} a_1x + b_1y + c_1z &= d_1 + e_1 \\ a_2x + b_2y &= d_2 \\ a_3x + b_3y + c_3z &= d_3 \end{array} \right.$$


```

- Vertical space between equations. As explained in [Definition by cases](#) to get a larger vertical space between equations we can use `\\[2ex]` instead of `\\`. The system

$$\begin{cases} a_1x + b_1y + c_1z = \frac{p_1}{q_1} \\ a_2x + b_2y + c_2z = \frac{p_2}{q_2} \\ a_3x + b_3y + c_3z = \frac{p_3}{q_3} \end{cases}$$

is generated by the following code

```


$$\begin{cases} a_1x + b_1y + c_1z = d_1 \\ a_2x + b_2y + c_2z = d_2 \\ a_3x + b_3y + c_3z = d_3 \end{cases}$$


```

in comparison with

$$\begin{cases} a_1x + b_1y + c_1z = \frac{p_1}{q_1} \\ a_2x + b_2y + c_2z = \frac{p_2}{q_2} \\ a_3x + b_3y + c_3z = \frac{p_3}{q_3} \end{cases}$$

whose code is

```

0 = c_x-a_{x0}-d_{x0}\dfrac{(c_x-a_{x0})\cdot d_{x0}}{\|d_{x0}\|^2} + c_x-a_{x1}-d_{x1}\dfrac{(c_x-a_{x1})\cdot d_{x1}}{\|d_{x1}\|^2} \\
d_{x1}\dfrac{(c_x-a_{x1})\cdot d_{x1}}{\|d_{x1}\|^2} \\
0 = c_y-a_{y0}-d_{y0}\dfrac{(c_y-a_{y0})\cdot d_{y0}}{\|d_{y0}\|^2} + c_y-a_{y1}-d_{y1}\dfrac{(c_y-a_{y1})\cdot d_{y1}}{\|d_{y1}\|^2} \end{array} \right.

```







produces

$$\left\{ \begin{array}{l} 0 = c_x - a_{x0} - d_{x0} \frac{(c_x - a_{x0}) \cdot d_{x0}}{\|d_{x0}\|^2} + c_x - a_{x1} - d_{x1} \frac{(c_x - a_{x1}) \cdot d_{x1}}{\|d_{x1}\|^2} \\ 0 = c_y - a_{y0} - d_{y0} \frac{(c_y - a_{y0}) \cdot d_{y0}}{\|d_{y0}\|^2} + c_y - a_{y1} - d_{y1} \frac{(c_y - a_{y1}) \cdot d_{y1}}{\|d_{y1}\|^2} \end{array} \right.$$

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edited Mar 16 '17 at 16:37

community wiki
11 revs, 2 users 93%
Américo Tavares

-
- 5  Is it possible to rotate text? To have a vertical word written in front of the large curly bracket that spans over all the equations? – [Steeven](#) Jul 3 '17 at 14:21 
-
- 4  @Steeven Go here → math.meta.stackexchange.com/questions/27798/... – [Mr Pie](#) Feb 1 '18 at 4:32 
-
- 1  Thank you, @user477343. This would be a useful feature on this list. – [Steeven](#) Feb 1 '18 at 14:38 
-

Colors

- 114 Named colors are browser-dependent; if a browser doesn't know a particular color name, it may render the text as black. The following colors are standard in HTML4 and CSS2 and should be interpreted the same by most browsers:

<code>\color{black}{text}</code>	<i>text</i>
<code>\color{gray}{text}</code>	<i>text</i>
<code>\color{silver}{text}</code>	<i>text</i>
<code>\color{white}{text}</code>	<i>text</i>
<code>\color{maroon}{text}</code>	<i>text</i>
<code>\color{red}{text}</code>	<i>text</i>
<code>\color{yellow}{text}</code>	<i>text</i>
<code>\color{lime}{text}</code>	<i>text</i>
<code>\color{olive}{text}</code>	<i>text</i>
<code>\color{green}{text}</code>	<i>text</i>
<code>\color{teal}{text}</code>	<i>text</i>
<code>\color{aqua}{text}</code>	<i>text</i>
<code>\color{blue}{text}</code>	<i>text</i>
<code>\color{navy}{text}</code>	<i>text</i>
<code>\color{purple}{text}</code>	<i>text</i>
<code>\color{fuchsia}{text}</code>	<i>text</i>

HTML5 and [CSS 3](#) define [an additional 124 color names that will be supported on many browsers](#).

Math Stack Exchange's default style uses a light-colored page background, so avoid using light colors for text. Stick to darker colors like maroon, green, blue, and purple, and remember also that 7–10% of men are color-blind and have difficulty distinguishing red and green.

The color may also have the form `#rgb` where r, g, b are in the range $0 - 9$, $a - f$ and represent the intensity of red, green, and blue on a scale of 0–15, with $a = 10$, $b = 11$, ... $f = 15$. For example:

#000	text	#00F	text	
	#0F0	text	#0FF	text
#F00	text	#F0F	text	
	#FF0	text	#FFF	text

<code>#000</code>	<i>text</i>	<code>#005</code>	<i>text</i>	<code>#00A</code>	<i>text</i>	<code>#00F</code>	<i>text</i>
<code>#500</code>	<i>text</i>	<code>#505</code>	<i>text</i>	<code>#50A</code>	<i>text</i>	<code>#50F</code>	<i>text</i>
<code>#A00</code>	<i>text</i>	<code>#A05</code>	<i>text</i>	<code>#A0A</code>	<i>text</i>	<code>#A0F</code>	<i>text</i>
<code>#F00</code>	<i>text</i>	<code>#F05</code>	<i>text</i>	<code>#F0A</code>	<i>text</i>	<code>#F0F</code>	<i>text</i>


#5F0	<i>text</i>	#5F5	<i>text</i>	#5FA	<i>text</i>	#5FF	<i>text</i>
#AF0	<i>text</i>	#AF5	<i>text</i>	#AFA	<i>text</i>	#AFF	<i>text</i>
#FF0	<i>text</i>	#FF5	<i>text</i>	#FFA	<i>text</i>	#FFF	<i>text</i>

You can have a look [here for quick reference on colors in HTML](#).

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edited Aug 11 '14 at 18:54

community wiki
6 revs, 3 users 70%
MJD

11  We should add that colors can be used on items other than text, such as variables and operators. The '\color' command applies to the next item: surround anything longer with braces. – [Rory Daulton](#) Feb 21 '15 at 20:30

2  Grand. This is so useful. – [Always Confused](#) May 19 '17 at 13:41

|

Additional decorations

112


 $\overline{\overline{A} \overline{AA} \overline{AAA}}$

 $\underline{\underline{B} \underline{BB} \underline{BBB}}$
 $\widetilde{\tilde{C} \widetilde{CC} \widetilde{CCC}}$
 $\widehat{\widehat{D} \widehat{DD} \widehat{DDD}}$
 $\boxed{E} \boxed{EE} \boxed{EEE}$
 $\underleftarrow{\overrightarrow{F} \overrightarrow{FF} \overrightarrow{FFF}} \quad \text{variant: } \xleftarrow{\overrightarrow{abc}}$
 $\underrightarrow{\overrightarrow{G} \overrightarrow{GG} \overrightarrow{GGG}} \quad \text{variant: } \xrightarrow{\overrightarrow{abc}}$
 $\underleftrightharpoonup{\overleftrightarrow{H} \overleftrightarrow{HH} \overleftrightarrow{HHH}}$
 $\overrightarrow{\overrightarrow{AB} \overrightarrow{ABAB} \overrightarrow{ABABAB}}$
 $\overbrace{(n-2) + (n-1) + n + (n+1) + (n+2)}$
 $\underbrace{(n-2) + (n-1) + n + (n+1) + (n+2)}$

$\overbrace{\hspace{1cm}}$ and $\underbrace{\hspace{1cm}}$ accept a superscript or a subscript, respectively, to annotate the brace. For example, $\underbrace{a \cdots a}_{b \text{ times}}$ is

$$\underbrace{a \cdot a \cdots a}_{b \text{ times}}$$

Note: $\varliminf : \underline{\lim}$ and $\varlimsup : \overline{\lim}$ have special symbol of their own.

Single character accents

 $\check{\mathit{I}}$
 $\acute{\mathit{J}}$
 $\grave{\mathit{K}}$

`\tilde` : \tilde{x}

`\dot` `\ddot` `\dddot` : \dot{x} , \ddot{x} , \dddot{x}

`\mathring` : \mathring{A}

General stacking

If you cannot find your symbol remember that you can stack various symbols using

`\overset{above}{level}` : $\overset{A}{ABC} \xrightarrow{x^2} \overset{\bullet\circ\circ\bullet}{T}$

`\underset{below}{level}` : $\underset{A}{ABC} \xrightarrow{x^2} \underset{\bullet\circ\circ\bullet}{T}$

You can use these together too. You can type $X \xrightarrow[a]{a} Y$ with `x\overset{a}{\underset{b}{\to}}Y`.








Arc over points

`\overset{\huge\frown}{PQ}` : $\overset{\frown}{PQ}$ denotes the arc over points P and Q (As per comment of @Calvin Khor to @Paul Sinclair's question)

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edited Dec 30 '19 at 16:56

community wiki
11 revs, 7 users 56%
Américo Tavares

- 2  added arrows with text variants, some new single char accents and general stacking section. – [zwim](#)
Oct 27 '17 at 1:42 
- 3  `stackrel` also seems to work well, as in `\stackrel{\text{def}}{=}` $\xrightarrow{\text{def}}$ – [Reb.Cabin](#) Feb 6 '18 at 16:48
- 1  The best I've been able to come up with is `\overset{\frown}{PQ}` : $\overset{\frown}{PQ}$. But since `\frown` doesn't adjust in size, it doesn't look right. Does anyone know how get a properly sized arc? – [Paul Sinclair](#) Sep 20 '19 at 23:47 
- 2  @PaulSinclair I offer the following `\overset{\frown}{AB}\overset{\large\frown}{CD}\overset{\Large\frown}{EF}\overset{\huge\frown}{GH}\overset{\Huge\frown}{ABC}` $\overset{\frown}{ABC} \overset{\large\frown}{AB} \overset{\Large\frown}{CDE} \overset{\huge\frown}{FGH} \overset{\Huge\frown}{ABC}$ – [Calvin Khor](#) Sep 22 '19 at 7:11 

Commutative diagrams

108 AMScd diagrams must start with a "require":

```
\require{AMScd}$
\begin{CD}
A @>a>> B \\
@V b VV = @VV c V \\
C @>>d> D
\end{CD}
```

to get this diagram:

$$\begin{array}{ccc} A & \xrightarrow{a} & B \\ b \downarrow & = & \downarrow c \\ C & \xrightarrow{d} & D \end{array}$$

@>>> is used for arrow right

@<<< is used for arrow left

@VVV is used for arrow down

@AAA is used for arrow up

@= is used for horizontal double line

@| is used for vertical double line

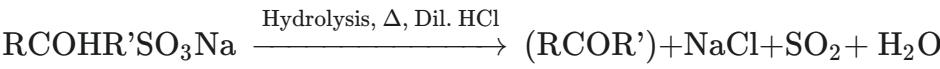
@. is used for no arrow

Another example:

```
\begin{CD}
A @>>> B @>\text{very long label}>> C \\
@. @AAA @| \\
D @= E @<<< F
\end{CD}
```

$$\begin{array}{ccccc} A & \longrightarrow & B & \xrightarrow{\text{very long label}} & C \\ & & \uparrow & & \parallel \\ D & \xlongequal{\quad} & E & \longleftarrow & F \end{array}$$







Long labels increase the length of the arrow and in this version also automatically increase corresponding arrows



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edited Jan 28 '20 at 10:52

community wiki
10 revs, 5 users 68%
Lehs

-
- 3


I realize this thread is quite old, but what about diagonal arrows? – Alfred Yerger Mar 23 '17 at 5:01
-
- 2


@AlfredYerger: there are no such possibilities in AMScd. – Lehs Sep 28 '17 at 3:57
-
- 2


@AlfredYerger Maybe presheaf can help there? See also answer and suggestions about this here:
[How to draw a commutative diagram?](#) – Martin Sleziak Nov 6 '17 at 11:44
-

|

Continued fractions

94 To make a continued fraction, use `\cfrac`, which works just like `\frac` but typesets the results differently:



$$x = a_0 + \cfrac{1^2}{a_1 + \cfrac{2^2}{a_2 + \cfrac{3^2}{a_3 + \cfrac{4^4}{a_4 + \dots}}}}$$

Don't use regular `\frac` or `\over`, or it will look awful:

$$x = a_0 + \cfrac{1^2}{a_1 + \cfrac{2^2}{a_2 + \cfrac{3^2}{a_3 + \cfrac{4^4}{a_4 + \dots}}}}$$

You can of course use `\frac` for the compact notation:

$$x = a_0 + \frac{1^2}{a_1 + \frac{2^2}{a_2 + \frac{3^2}{a_3 + \frac{4^4}{a_4 + \dots}}}}$$

Continued fractions are too big to put inline. Display them with `$$... $$` or use a notation like $[a_0; a_1, a_2, a_3, \dots]$.


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answered Aug 31 '12 at 19:46


community wiki
MJD


- 3  The RHS of the following continued fraction

$$\frac{a_1}{b_1 + \frac{a_2}{b_2 + \frac{a_3}{b_3 + \ddots}}} = \frac{a_1}{b_1} + \frac{a_2}{b_2} + \frac{a_3}{b_3} + \dots$$

can be typeset with the `\genfrac` command '`\genfrac{}{}{}{a_1}{b_1}}{\genfrac{}{}{}{a_2}{b_2}}{\genfrac{}{}{}{a_3}{b_3}}{\genfrac{}{}{}{a_4}{b_4}}{\genfrac{}{}{}{a_5}{b_5}}{\genfrac{}{}{}{a_6}{b_6}}{\genfrac{}{}{}{a_7}{b_7}}{\genfrac{}{}{}{a_8}{b_8}}{\genfrac{}{}{}{a_9}{b_9}}{\genfrac{}{}{}{a_{10}}{b_{10}}}`' – [Américo Tavares](#) Sep 17 '12 at 20:39 


- 1  Yes, it is. I didn't mention it because in *User's Guide for the amsmath Package* it is written the following: "Note. For technical reasons, using the primitive fraction commands `\over`, `\atop`, `\above` in a LATEX document is not recommended (see, e.g., `amsmath.faq`)." – [Américo Tavares](#) Sep 17 '12 at 22:44

- 4  Happily, we are not writing *LATEX* documents here. – [MJD](#) Sep 17 '12 at 22:44


- 10  Or write `\underset{j=1}{\overset{\infty}{\LARGE\mathrm K}}\frac{a_j}{b_j}=\frac{a_1}{b_1+\frac{a_2}{b_2+\frac{a_3}{b_3+\ddots}}}` to get

$$\overset{\infty}{\underset{j=1}{\mathrm K}} \frac{a_j}{b_j} = \frac{a_1}{b_1 + \frac{a_2}{b_2 + \frac{a_3}{b_3 + \ddots}}}$$

– [Américo Tavares](#) Jan 24 '13 at 9:15 

- 8  @AméricoTavares Or use `\mathop` instead of `\overset` and `\underset` : `\mathop{\LARGE\mathrm K}_{i=1}^{\infty} \frac{a_i}{b_i}`

$$\overset{\infty}{\underset{i=1}{\mathrm K}} \frac{a_i}{b_i}$$

– [AlexR](#) Feb 21 '15 at 20:48 

|

▲ Using `\newcommand`

91

I would like to remark that it is possible to define LaTeX commands as you do in your TeX files. I felt so happy when I first discovered it! It's enough to insert something like



```
\newcommand{\SES}[3]{ 0 \to #1 \to #2 \to #3 \to 0 }
```

at the top of your post (remember the dollars!). Then you can just use your commands as you are used to do: in my example typing `$$ \SES{A}{B}{C} $$` will produce the following:

$$0 \rightarrow A \rightarrow B \rightarrow C \rightarrow 0$$

It's also possible to use plain `\def` :

```
\def\ses#1#2#3{0 \to #1 \to #2 \to #3 \to 0}
```

and then `$$\ses{A}{B}{C}$$` will produce the same output.

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edited Feb 12 '15 at 12:43

community wiki
3 revs, 3 users 67%
Abramo

10 ▲ Be aware that this affects the entire post, possibly even the frontpage, so it should be used [with great care](#). – AlexR Feb 21 '15 at 20:55 ✎

4 ▲ @AlexR It's been fixed since. – iBug Apr 10 '19 at 3:40

|

Tags & References

91



For longer calculations (or referring to other post's results) it is convenient to use the tagging/labelling/referencing system. To tag an equation use `\tag{yourtag}`, and if you want to refer to that tag later on, add `\label{somelabel}` right after the `\tag`. It is not necessary that `yourtag` and `somelabel` are the same, but it usually is more convenient to do so:

```
$$ a := x^2-y^3 \tag{*}\label{*} $$
```

$$a := x^2 - y^3 \tag{*}$$

In order to refer to an equation, just use `\eqref{somelabel}`

```
$$ a+y^3 \stackrel{\eqref{*}}{=} x^2 $$
```

$$a + y^3 \stackrel{(*)}{=} x^2$$

or `\ref{somelabel}`

Equations are usually referred to as `\eqref{*}`, but you can also use `\ref{*}`.

Equations are usually referred to as [\(*\)](#), but you can also use [*](#).

As you can see, references are even turned into hyperlinks, which you can use externally as well, e.g. [like this](#). Note that you can also reference labels in other posts as long as they appear on the same site, which is especially useful when referring to a question with multiple equations, or when commenting on a post.

Due to a [bug blocks containing a \label will break in preview](#), as [a workaround you can put `\def\label#1{}\$` in your post while editing and remove that on submission](#) – unfortunately this means you won't spot misspelled references before submitting... **Just don't forget to remove that `\def` again**

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edited Apr 13 '17 at 12:22

community wiki

3 revs



Tobias Kienzler

10  Also works in comments: `\eqref{*}` yields a clickable (*) – Tobias Kienzler Oct 31 '13 at 10:22 

5  I'm just curious, is there a way to have the tags on the *left side* of the equation? Something like

$$(1) \quad \sum_j k$$


But the (1) tag is all the way to the left. – Crescendo Aug 26 '17 at 16:46 

1  Hey, I figured how to tag without brackets. You simply put what is inside the braces: `{\tag*{...}}` which I learnt from here → math.meta.stackexchange.com/questions/27731/... – Mr Pie Jan 28 '18 at 0:42 

|

 `\implies` (\implies) is a [marginally preferable](#) alternative to `\Rightarrow` (\Rightarrow) for implication.

85 There's also `\iff` (\iff) and `\impliedby` (\impliedby).

 `\to` (\rightarrow) is preferable to `\rightarrow` or `\longrightarrow` for things like $f: A \rightarrow B$. The reverse is `\gets` (\leftarrow).







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edited Apr 13 '17 at 12:34

community wiki
4 revs, 3 users 71%
leonbloy

6  Why is it preferable? – MJD Jul 9 '13 at 20:00 


17  `implies` looks nicer as the arrow is longer and `\to` is quicker to right (and it's also what you say in your head while typing it). at least that's what I think. – John Salvatierrez Jul 29 '13 at 13:21 

2  Remember the difference between `\to` and `\mapsto` as in $T: \mathbb{R} \rightarrow \mathbb{R}, x \mapsto x + 1$ produced by `T:\mathbb{R}\to \mathbb{R}; x\mapsto x+1` – yo' Aug 25 '14 at 9:57 

8  I prefer using `\to` when it appears as part of a larger propositional formula, rather than at the top level, i.e. $p \wedge ((q \vee r) \rightarrow s)$, because the spacing is similar to that of other binary operators. `\implies` is better for sentence- or clause-level implications, or in displays, i.e.

$$x + 2 = 4 - x \implies x = 1.$$

– Mario Carneiro Feb 2 '15 at 14:22

1  @Alexandros yes `\overset{3.1415}{\underset{26535}{\implies}}` produces

$$\overset{3.1415}{\underset{26535}{\implies}}$$

– user645636 Feb 8 '20 at 12:12

|

▲ Big braces

75

Use `\left` and `\right` to make braces - (round), [square] and {curly} - scale up to be the size of their arguments. Thus



```


$$f\left(\left[\frac{1+\left\{x,y\right\}}{\left(\frac{x}{y}+\frac{y}{x}\right)\left(u+1\right)}+a\right]^{3/2}\right)$$


```

renders as

$$f\left(\left[\frac{1+\{x,y\}}{\left(\frac{x}{y}+\frac{y}{x}\right)(u+1)}+a\right]^{3/2}\right).$$

Note that curly braces need to be escaped as `\{ \}`.

If you start a big brace with `\left` and then need to match that to a `\right` brace that's on a different line, use the forms `\right.` and `\left.` to make "shadow" braces. Thus,

```


$$a=\left(1+2+3+\cdots\right.\backslash\backslash$$


$$\left.\infty-2+\infty-1+\infty\right)$$


```

renders as

$$a=(1+2+3+\cdots\cdots+\infty-2+\infty-1+\infty).$$

There is also a `\middle` construct which is useful when one has a mid-expression brace which must also scale up:

```


$$\left\langle$$


```

renders as


$$\left\langle q \left\| \begin{array}{c} \frac{x}{y} \\ \frac{u}{v} \end{array} \right\| p \right\rangle .$$

Note that constructs like `\left\langle`, `\left|` and `\left\|` are also possible.

Share Edit Follow Flag

answered Oct 25 '13 at 17:47

community wiki
E.P.

-
- 4  Note: `\Big(... \Big)` produces $(...)$ but this bracket size is fixed in all situations unlike `\left(... \right)` which varies in size with its contents. `\Big` can be useful in various situations. – Nick Dec 19 '14 at 6:34
-



Limits

71

To make a limit (like $\lim_{x \rightarrow 1} \frac{x^2-1}{x-1}$), use this syntax:



First, start off with `\lim`. This renders as \lim . The backslash is there to prevent things like *lim*, where the letters are slanted.

Second, add `\limits_{x \to 1}` inside. The code now looks like `\lim \limits_{x \to 1}`, and renders as $\lim_{x \rightarrow 1}$. The `\to` inside makes the right arrow, rendered as \rightarrow . The `_` makes the $x \rightarrow 1$ go underneath the \lim . Finally, the pair of curly braces `{ }` makes sure that $x \rightarrow 1$ is treated as a whole object, and not two separate things.

Lastly, add the function you want to apply the limit to. To make the limit mentioned above, $\lim_{x \rightarrow 1} \frac{x^2-1}{x-1}$, simply use `\lim \limits_{x \to 1} \frac{x^2-1}{x-1}`.

And that is how you make a limit using MathJax.

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edited Jul 17 '14 at 12:25

community wiki

2 revs, 2 users 94%

JChau


26  Why not just `\lim_{x\to 1}`





$$\lim_{x \rightarrow 1}?$$



As I understand it `\limits` is only needed for operations that don't already understand limits, for example if you want to use $+$ and get



$$\sum_{i=1}^k \text{ instead of } +_{i=1}^k$$

When used inline, your suggestion will produce \lim instead of the more compact form $\lim_{x \rightarrow 1}$ that mathjax normally chooses. Are you sure this is good advice? – [MJD](#) Feb 26 '14 at 14:10 


4  @MJD `\lim_{x\to 1}` renders to $\lim_{x \rightarrow 1}$, and `\lim\limits_{x\to 1}` renders as $\lim\limits_{x \rightarrow 1}$. Note how the $x \rightarrow 1$ is separated from the first limit, and not directly underneath. We do not write limits like that in real life, so we use `\limits`. – [TrueDefault](#) Feb 26 '14 at 16:19 

2  I meant that the second limit renders to $\lim_{x \rightarrow 1}$ – [TrueDefault](#) Feb 26 '14 at 16:28 

9  Limits are usually written that way in typeset materials like papers and books when the limit is inline, rather than a displayed formula, and that's why MathJax typesets it that way. – [MJD](#) Feb 26 '14 at 16:41 

13  The issue with this answer is that it is trying to "force" display mode on inline code. Doing so makes the text look less pretty. For example, see how the spacing between the lines change when I force display mode using `\lim\limits_{x\mapsto 1}\dfrac{1}{x}` : $\lim_{x \mapsto 1} \frac{1}{x}$. On the other hand, when I let TeX do what it wants to do, using `\lim_{x\mapsto 1}\frac{1}{x}`, the spacing between the lines stays the same, which is much neater: $\lim_{x \mapsto 1} \frac{1}{x}$. This is much easier on the eyes. If you want to make your math mode more prominent then take a new line using `$$-$$` – [user1729](#) Jul 17 '14 at 12:30 

7  The moral is: TeX was written by a [jolly clever chap](#). Let it do what it wants, because it does it for a reason! – [user1729](#) Jul 17 '14 at 12:35

2  Part 11 of the "question" shows how to write limits in the way they were meant to be written in LaTeX and MathJax. – [David K](#) Nov 14 '15 at 23:17

Arbitrary operators

61

If an operator is not available as a built-in command, use `\operatorname{...}`. So for things like

$$\operatorname{arsinh}(x)$$



write `\operatorname{arsinh}(x)` since `\arsinh(x)` will give an error and `arsinh(x)` has wrong font and spacing: *arsinh*(*x*).

This was already mentioned in [a comment](#) by [Charles Staats](#). You might consider this an addition to the FAQ section on `\lim`, `\sin` and so on.

For operators which need limits above and below the operator, use `\operatorname*{...}`, as in

$$\operatorname*{Res}_{z=1}\left(\frac{1}{z^2 - z}\right) = 1$$

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edited Sep 16 '15 at 3:13

community wiki

2 revs, 2 users 62%

MvG

1 We can also use `{\rm ...}`. For example, `{\rm arsinh}` yields *arsinh*. – [Felix Marin](#) Aug 12 '14 at 0:27

18 @Felix: `\rm` will change the font but not the spacing. `\operatorname{arsinh}x` renders as “*arsinh x*” while `{\rm arsinh}x` renders as “*arsinhx*”. Notice the added space between operator and operand in the first example, which is missing in the second. On the whole, I'd say that `\operatorname` is a lot more in the spirit of semantic markup, declaring *what* you want to write instead of *how* you want to write it, so I'd strongly suggest using this. – [MvG](#) Aug 13 '14 at 11:27

5 Thanks. I didn't know there was a difference between them. I always avoided `\operatorname` because it was too long. – [Felix Marin](#) Aug 13 '14 at 14:41

2 Thanks for this. I thought carefully about whether to put `\operatorname` in the main post, and decided to leave it out. The reason is simple: If a beginner omits `\operatorname`, the resulting formula will still be perfectly clear, and a more experienced user will have no trouble inserting the `\operatorname` where it is needed. So including it in the main post would not be a good use of space. – [MJD](#) Aug 16 '14 at 6:28

3 ... I always use `"\text{operator}"`. Hmmm, *arsinh x* vs *arsinh x*. – [JP McCarthy](#) Feb 10 '15 at 16:48

4 If you use the same operator many times, I think you can do `\DeclareMathOperator{\arsinh}{arsinh}` at the post's top. Never tried it though... – [MickG](#) Aug 15 '15 at 17:28

|

▲ Highlighting equation

60

To highlight an equation, `\bbox` can be used. E.g,



```


$$\lim_{n \rightarrow \infty} \left( 1 + \frac{x}{n} \right)^n$$

\qquad (1)

```

produces

$$e^x = \lim_{n \rightarrow \infty} \left(1 + \frac{x}{n} \right)^n \quad (1)$$

By default, the bounding box is "tight", so it doesn't extend beyond the characters used in the formula. You can add a little space around the equation by adding a measurement after the color. E.g.,

```


$$\lim_{n \rightarrow \infty} \left( 1 + \frac{x}{n} \right)^n$$

\qquad (1)

```

produces

$$e^x = \lim_{n \rightarrow \infty} \left(1 + \frac{x}{n} \right)^n \quad (1)$$

To add a border, use

```


$$\lim_{n \rightarrow \infty} \left( 1 + \frac{x}{n} \right)^n$$

\qquad (2)

```

produces

$$e^x = \lim_{n \rightarrow \infty} \left(1 + \frac{x}{n} \right)^n \quad (2)$$

You can do both border and background, as well:





produces

$$e^x = \lim_{n \rightarrow \infty} \left(1 + \frac{x}{n}\right)^n \quad (1)$$

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edited Jul 4 '16 at 11:05

community wiki
4 revs, 3 users 53%
webbertiger

-
- 2  When using constructs like this, please heed the points raised in [this discussion](#) on usage of colour.
 – [Lord_Farin](#) May 20 '16 at 15:56
-
- 1  This would be a very helpful feature. – [Always Confused](#) May 19 '17 at 13:36

-

▲ Absolute values and norms

52

The absolute value of some expression can be denoted as `\lvert x\rvert` or, more generally, as `\left\lvert ... \right\rvert`. It renders as $|x|$.



The norm of a vector (or similar) can be denoted as `\lVert v\rVert` or, more generally, as `\left\lVert ... \right\rVert`. It renders as $\|v\|$. (You may also write `\left|...\right|` instead.)

In both cases, the rendering is better than what you'd get from `|x|` or `\|v\|`, which render with bars that don't descend low enough and sub-optimal spacing. At least on some browsers, so here is a screenshot how it looks for me, using Firefox 31 on OS X:

$$|x|, \|v\| \longrightarrow \lvert x \rvert, \lVert v \rVert$$

And here is the same formula rendered by your browser:

$$|x|, \|v\| \longrightarrow |x|, \|v\|$$

It was typeset as

`$$|x|, \|v\| \quad\quad\quad \lvert x \rvert, \lVert v \rVert$$`

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edited Aug 13 '14 at 11:59

community wiki

4 revs, 3 users 89%

MvG

-
- 7 ▲ You can use `\|x\|` instead of `\lVert x \rVert`; $\|x\|$ and $\|x\|$. (I don't think that there is a difference between them. I've tried [asking on SE](tex.stackexchange.com/questions/77767/whats-the-correct-way-to-write-norm).) – [Martin Sleziak](#) Jun 24 '14 at 8:48
-
- 3 ▲ The difference in output that you are seeing has to do with whether you have the STIX fonts installed locally on your computer or not. The `|` in STIX doesn't descend below the baseline, while in the MathJax TeX fonts it does. – [Davide Cervone](#) May 20 '16 at 14:16
-

|

▲ Giving reasons on each line of a sequence of equations

50 To produce this:



$$\begin{array}{ll} v + w = 0 & \text{Given} \tag{1} \\ -w = -w + 0 & \text{additive identity} \tag{2} \\ -w + 0 = -w + (v + w) & \text{equations (1) and (2)} \end{array}$$

write this:

```
\begin{align}
  v + w &= 0 && \text{\text{Given}} \tag{1}\\
  -w &= -w + 0 && \text{\text{additive identity}} \tag{2}\\
  -w + 0 &= -w + (v + w) && \text{\text{equations (1) and (2)}}
\end{align}
```

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edited Feb 15 '16 at 18:33

community wiki

2 revs

David K

-
- 1 ▲ Using multiple `\tag` commands in my equations causes them to break. It only takes one tag per equation and it labels the entire thing instead of allowing tagging on a *per-line* basis. Any ideas? – [code_dredd](#) Jun 1 '19 at 20:19
-

|

▲ Pack of cards

47

If you are asking (or answering) a combinatorics question involving packs of cards you can make it look more elegant by using `\spadesuit` , `\heartsuit` , `\diamondsuit` , `\clubsuit` in math mode:



Or if you're really fussy:

`\color{red}{\heartsuit}` and `\color{red}{\diamondsuit}`



You can also enter the standard Unicode characters (`U+2660` BLACK SPADE SUIT etc.) literally, or copy them from here:



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edited May 29 '18 at 16:09

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3 revs, 3 users 53%
David

-
- 1 ▲ This is very nice! Is there other auto-shapes or stickers? – [Always Confused](#) May 19 '17 at 13:37
 1 ▲ Is it also possible to draw the spade and club in outlines and fill the heart and diamond with a colour? – [Always Confused](#) May 19 '17 at 13:39
-
- 2 ▲ @AlwaysConfused None that come to mind. Google search turned up [this](#) which might help. Otherwise search for a TeX/LaTeX/MathJax symbol table. – [David](#) May 22 '17 at 23:48
-
- 1 ▲ @AlwaysConfused Unicode has those characters, so you can enter them however you normally enter Unicode characters, or you can now use copy-paste to copy them from this answer. – [MJD](#) May 29 '18 at 16:11
-
- 1 ▲ @MJD Not sure that your edit is a good idea, firstly because I think we would prefer questions and answers on MSE to be in MathJax as far as possible, secondly because this page is specifically a MathJax tutorial. However I'm not really bothered - if you still think it's a good idea, let me know and I'll approve the edit. – [David](#) May 30 '18 at 4:31
-

|

▲ Left and Right Implication Arrows

41 Another way to display the arrows for right and left implication instead of using

▼ `$$\Rrightarrow$` , `$$\Leftarrow$` and `$$\Leftrightarrow$`

🕒 which produces \Rightarrow , \Leftarrow and \Leftrightarrow respectively, you can use

`$$\implies$` for \Rightarrow , `$$\impliedby$` for \Leftarrow and `$$\iff$` for \Leftrightarrow

The latter of which produces longer arrows which may be more desirable to some.

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edited May 6 '14 at 22:15

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3 revs, 2 users 74%
jnh

▲ Degree symbol

36

Standard Mathjax does not yet support a dedicated degree symbol, so here are some of the ways to try and emulate one :



45^{o}	renders as	45°	
45°	renders as	45°	
45°	renders as	45°	
45°	renders as	45°	
45°	renders as	45°	Actual Unicode character
90°	renders as	90°	Using keyboard entry of symbol

The degree symbol for angles is *not* $^{\circ}$. Although many people use this notation, the result looks quite different from the canonical [degree symbol](#) shipped with the font, as seen above.

If your keyboard doesn't have a  key, feel free to copy from this post here, or follow [these suggestions](#).

Note that comments below indicate that on some configurations at least, $^{\circ}$ renders inferior to $^{\circ}$. And I recently had [a post of mine edited](#) just for the sake of turning $^{\circ}$ into $^{\circ}$, indicating that someone felt rather strongly about this. So the suggestion above does seem somewhat controversial at the moment. I maintain that from a semantic point of view, $^{\circ}$ is superior to $^{\circ}$, and if the rendering suffers from this, then it's a bug in MathJax. After all, LaTeX offers a proper degree symbol in the tex companion fonts, indicating that someone there, too, decided that $^{\circ}$ is not perfect. But if things are broken now, I can't fault people from pragmatically sticking with the rendering they prefer. Personally I prefer semantics, also for the sake of screen readers.

Accessibility

Aside from appearance, one consideration in choosing which notation to use is how it will get parsed by screen readers. For example, [ChromeVox](#) reads both 45° and 45° as "forty-five degrees", while the other two are pronounced as "forty-five oh", which may be a reason to avoid them.








Usepackage

Commonly in Latex you can `\usepackage{gensymb}` to get the `\degree` symbol, however on Stack Exchange this is not an option. Note that even if you can do this it will typically affect the entire page, which may have side effects for other users. So don't rely on this approach.

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edited Feb 26 at 12:11

community wiki
10 revs. 6 users 47%

-
- 2   If mathjax loads siunitx or gensymb, there is then `\degree` in latex which is the degree symbol. – [dustin](#) Feb 17 '15 at 22:29 
-
- 1   @dustin: I couldn't find siunitx or gensymb mentioned anywhere in the MatJax source repository. Are they available as some kind of third-party extension? If so, where? Since MathJax is *not* LaTeX, packages can't be loaded unless they have been migrated. By the way, all occurrences of “degree” in the MathJax sources refer to something else, as far as I can tell, so there really doesn't seem to be a `\degree` macro. There should be one, imho. – [MvG](#) Feb 17 '15 at 23:39
-
- 2   I am not a mathjax expert. I just know latex. I just gave that suggestion in case they were available. [Siunitx](#) would be a great package to have. If you aren't familiar, you will see the advantage by scanning the documentation on ctan. – [dustin](#) Feb 17 '15 at 23:43
-
- 15   On my display, ° looks bad and `^\circ` looks good: a.pomf.se/xnlfyg.png – [MJD](#) Mar 24 '15 at 21:10
-
- 2   Degree sign can generally be typed by holding down `Alt` and typing `0176` on the numeric keypad. ° (I don't know how international the actual number is). The leading zero is required. – [Joffan](#) Apr 19 '17 at 14:04
-
- 1   @Joffan: 167 is the decimal representation of the Codepoint for ° in Latin 1, Unicode and CP-1252. Without the leading zero, CP-437 gets applied instead, at least in typical English-speaking countries, so you'd use `Alt+248` there. The Wikipedia article I linked to already describes those two ways of entering the symbol, and en.wikipedia.org/wiki/Alt_code has some more details. – [MvG](#) Apr 20 '17 at 22:24
-
- 1   @AbhasKumarSinha It looks quite slanty to me. – [Tom Hale](#) Jun 13 '18 at 3:57
-
- 3   @StephenG: I'm not happy with [your latest edit](#). I feel that it is not helpful to users if we suggest even more ways to poorly format that symbol (like `^o` imho), or to mention a LaTeX approach just to say it won't work. You deleted the example for `45°`, but kept the sentence talking about it, including the colon. I'm reluctant to revert your edit on a CW page without a conversation, but as it stands I see the edit as a change for the worse. Can we find a combined solution? – [MvG](#) Oct 8 '18 at 19:09
-
- |
-

Long division

33

```


$$\begin{array}{r}
13 \\
4 \overline{)52} \\
\underline{4} \phantom{0} \\
12 \\
\underline{12} \\
0
\end{array}$$


```

$$\begin{array}{r}
13 \\
4 \overline{)52} \\
\underline{4} \\
12 \\
\underline{12} \\
0
\end{array}$$

One important trick shown here is the use of `` to make a blank space that is the same size and shape as the digit 2 just above it.

This is adapted from <https://stackoverflow.com/a/22871404/3466415> (which uses slightly different but not less valid formatting).

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edited May 23 '17 at 12:39

community wiki
6 revs, 3 users 92%
David K


10  [Synthetic division](#). Example to find that

$$x^3 - 6x^2 + 11x - 6 = (x - 1)(x^2 - 5x + 6) + 0$$

	x^3	x^2	x^1	x^0
	1	-6	11	-6
1	↓	1	-5	6
	1	-5	6	0

```
\begin{array}{c|rrrr}& x^3 & x^2 & x^1 & x^0\\& 1 & -6 & 11 & -6\\ \color{red}1 & \downarrow & 1 & -5 & 6\\ \hline & 1 & -5 & 6 & \phantom{-}\\ \color{blue}0 & \end{array}
```

– [Américo Tavares](#) Aug 21 '16 at 14:32

1  I will need this. It is so useful. – [Always Confused](#) May 21 '17 at 16:09


1  What about long division? – [Aqua](#) Aug 14 '18 at 8:54

1  @Maria Mazur For the same example $\frac{x^3 - 6x^2 + 11x - 6}{x - 1} = x^2 - 5x + 6$:

x^3	$-6x^2$	$+11x$	-6	$x - 1$
$-x^3$	$+x^2$			$x^2 - 5x + 6$
	$-5x^2$	$+11x$	-6	
	$5x^2$	$-5x$		
		$+6x$	-6	
		$-6x$	$+6$	
		0	0	

I've used this code

```
\begin{array}{rrrr|l} x^3 & -6x^2 & +11x & -6 & x - 1 \\ -x^3 & +x^2 & & & x^2-5x+6 \\ \hline & -5x^2 & +11x & -6 & \\ & 5x^2 & -5x & & \\ \hline & & +6x & -6 & \\ & & -6x & +6 & \\ \hline & & 0 & 0 & \end{array}
```

 – [Américo Tavares](#) May 16 '19 at 20:06 

▲ Displaystyle and Textstyle

27



Many things like fractions, sums, limits, and integrals display differently when written inline versus in a displayed formula. You can switch styles back and forth with `\displaystyle` and `\textstyle` in order to achieve the desired appearance.

Here's an example switching back and forth in a displayed equation:

```


$$\sum_{n=1}^{\infty} \frac{1}{n^2} \rightarrow \sum_{n=1}^{\infty} \frac{1}{n^2} \rightarrow \sum_{n=1}^{\infty} \frac{1}{n^2}$$


```

$$\sum_{n=1}^{\infty} \frac{1}{n^2} \rightarrow \sum_{n=1}^{\infty} \frac{1}{n^2} \rightarrow \sum_{n=1}^{\infty} \frac{1}{n^2}$$

It is possible to switch style inline as well:

Compare `\displaystyle \lim_{t \rightarrow 0} \int_t^1 f(t) dt` versus `\lim_{t \rightarrow 0} \int_t^1 f(t) dt`.

Compare $\lim_{t \rightarrow 0} \int_t^1 f(t) dt$ versus $\lim_{t \rightarrow 0} \int_t^1 f(t) dt$.

Share Edit Follow Flag

answered Sep 23 '16 at 6:02

community wiki
Alexis Olson

4 ▲ Oh!! I was always confused on why some people had `\displaystyle` . – Simply Beautiful Art Nov 7 '16 at 0:42

1 ▲ @SimplyBeautifulArt I was always wondering on why the math expressions of some people looked nicer than mine.. – user486983 Sep 21 '18 at 21:37

|

Vertical Spacing

26

Some formulas such as $\bar{a} + \bar{b} = \overline{a \cdot b}$, $\sqrt{a} - \sqrt{b}$, do not look quite right when it comes to vertical spacing. Fortunately, there is more than one way to fix this. One can for instance employ the `\mathstrut` command as follows:

```
\sqrt{\mathstrut a} - \sqrt{\mathstrut b}
```

Which yields: $\sqrt{a} - \sqrt{b}$. Or using `\vphantom` (vertical phantom) command, which measures the height of its argument and places a math strut of that height into the formula.

```
\sqrt{\vphantom{b} a} - \sqrt{b}
```

Which renders as: $\sqrt{a} - \sqrt{b}$.

Another issue is with the spacing within lines in situations like this,

Based on the previous technique, we can simplify $\frac{1}{\sqrt{a} - \sqrt{b}}$, and we thus get the result of the previous limit.

These two lines are too far apart, but this is unnecessary since the second line is very short. We can solve this by using the `\smash` command, to get:

Based on the previous technique, we can simplify $\frac{1}{\sqrt{a} - \sqrt{b}}$, and we thus get the result of the previous limit.

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edited Sep 24 '16 at 8:43

community wiki

2 revs

Workaholic

|

Equation numbering

23

Simple equation



To give an equation a number, use the `\tag{}`. To refer to it later, use `\label{}` to label this equation. When you want to refer to it, use `\eqref{}`. For example,

$$e = mc^2 \tag{1}$$

Equation [\(1\)](#) is one the greatest equations in mankind history. Equation [\(1\)](#) is produced using the following code,

```
$$e=mc^2 \tag{1}\label{eq1}$$
```

To refer to it, use `\eqref{eq1}`.

Multi-line equation

Multi-line equation is actually just one equation rather than several equations. So the correct environment is `aligned` instead of `align`.

$$\begin{aligned} a &= b + c \\ &= d + e + f + g \\ &= h + i \end{aligned} \tag{2}$$

Equation [\(2\)](#) is a multi-line equation. The code to produce equation [\(2\)](#) is

```
$$\begin{equation}\begin{aligned} a &= b + c \\ &= d + e + f + g \\ &= h + i \end{aligned}\end{equation}\tag{2}\label{eq2}$$
```

Multiple aligned equations

For multiple aligned equations, we use the `align` environment.

$$a = b + c \tag{3}$$

$$x = yz \tag{4}$$

$$l = m - n \tag{5}$$

Equation [\(3\)](#), [\(4\)](#) and [\(5\)](#) are multiple equations aligned together. The code to produce these equations is,

Share Edit Follow Flag

edited Nov 8 '18 at 19:57

community wiki
2 revs, 2 users 93%
jdhao

|

```

\begin{bmatrix}
1 & 2 & 2 \\
2 & 3 & 4 \\
4 & 4 & 2
\end{bmatrix}

```

converts

```

A = [1 2 2; 2 3 4; 4 4 2]
A =

```

```

1 2 2
2 3 4
4 4 2

```

to

```

\begin{bmatrix}
1 & 2 & 2 \\
2 & 3 & 4 \\
4 & 4 & 2
\end{bmatrix}

```

so that pasting the generated code gives

$$\begin{bmatrix} 1 & 2 & 2 \\ 2 & 3 & 4 \\ 4 & 4 & 2 \end{bmatrix}.$$

Simplex tableaux

Since the coefficient of the objective value variable z *never* changes, my habit is to omit the z -column to save ink.

Normal simplex tableau

```

\begin{array}{rrrrrr|rr}
& x_1 & x_2 & s_1 & s_2 & s_3 & & \\
s_1 & 0 & 1 & 1 & 0 & 0 & 8 & \\
s_2 & 1 & -1 & 0 & 1 & 0 & 4 & \\
s_3 & 1 & 1 & 0 & 0 & 1 & 12 & \\
& -1 & -1 & 0 & 0 & 0 & 0 & 
\end{array}

```

```

s_3 & 1 & 1 & 0 & 0 & 1 & 0 & 12 & 12 \\ \hdashline
& 1 & -1 & 0 & -1 & 0 & 0 & 4 & \\ \hline
s_1 & 0 & 1 & 1 & 0 & 0 & 0 & 8 & \\
x_1 & 1 & -1 & 0 & -1 & 0 & 1 & 4 & \\
s_3 & 0 & 2 & 0 & 2 & 1 & -1 & 8 & \\
& 0 & 0 & 0 & 0 & 0 & -1 & 0 & \\
\end{array}

```

	x_1	x_2	s_1	s_2	s_3	w	ratio
s_1	0	1	1	0	0	0	8 —
w	1*	-1	0	-1	0	1	4 4
s_3	1	1	0	0	1	0	12 12
	1	-1	0	-1	0	0	4
s_1	0	1	1	0	0	0	8
x_1	1	-1	0	-1	0	1	4
s_3	0	2	0	2	1	-1	8
	0	0	0	0	0	-1	0

Dual simplex tableau

```

\begin{array}{rrrrrrrr|rr}
& x_1 & x_2 & x_3 & x_4 & x_5 & x_6 & x_7 & & \\
x_4 & 0 & -3 & 7 & 1 & 0 & 0 & 2 & 2M & -4 \\
x_5 & 0 & -9 & 0 & 0 & 1 & 0 & -1 & -M & -3 \\
x_6 & 0 & 6 & -1 & 0 & 0 & 1 & -4^* & -4M & +8 \\
x_1 & 1 & 0 & 1 & 0 & 0 & 0 & 1 & M & \\
& 0 & 1 & 1 & 0 & 0 & 0 & 2 & 2M & \\
\text{ratio} & & & 1 & & & & 1/2 & & \\
\end{array}

```

	x_1	x_2	x_3	x_4	x_5	x_6	x_7	
x_4	0	-3	7	1	0	0	2	$2M - 4$
x_5	0	-9	0	0	1	0	-1	$-M - 3$
x_6	0	6	-1	0	0	1	-4^*	$-4M + 8$
x_1	1	0	1	0	0	0	1	M

x_1	1	0	1	$-1/2$	0	0	30
x_2	0	1	$3/4$	$1/4$	$-1/4$	0	$5/2$
s_3	0	0	$5/4$	$3/4$	$-3/4^*$	1	$-39/2$
	0	0	$19/2$	$3/2$	$5/2$	0	-265
ratio					...		
x_1	1	0	1	$-1/2$	0	0	30
x_2	0	1	$1/3$	0	0	$-1/3$	9
s_2	0	0	$-5/3$	-1	1	$-4/3$	26
	0	0	$41/3$	4	0	$10/3$	-330

Duality

A picture is worth [a thousand words](#).

$$\begin{aligned} \max \quad & z = c^T x \\ \text{s.t.} \quad & Ax \leq b \\ & x \geq 0 \end{aligned}$$

(\mathcal{PC})

add \downarrow slack var

$$\begin{aligned} \max \quad & z = c^T x \\ \text{s.t.} \quad & Ax + s = b \\ & x, s \geq 0 \end{aligned}$$

(\mathcal{PS})

duality

 \Leftrightarrow

duality

 \Leftrightarrow

some steps skipped

$$\begin{aligned} \min \quad & v = b^T y \\ \text{s.t.} \quad & A^T y \geq c \\ & y \geq 0 \end{aligned}$$

(\mathcal{DC})

minus \downarrow surplus var

$$\begin{aligned} \min \quad & v = b^T y \\ \text{s.t.} \quad & A^T y - t = c \\ & y, t \geq 0 \end{aligned}$$

(\mathcal{DS})



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edited Feb 16 '19 at 9:55

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2021/06/07, 11:36

3  It must have taken *more* than a thousand words to write *that* picture though :D – Mr Pie Jul 20 '18 at 9:25 

▲ Units

13



While $LATEX$ has packages that format units, MathJax does not. For visual consistency, one should format units within the same string of MathJax code as the value to which it corresponds, separating the value and unit with `\` (space-backslash-space) since the [BIPM](#) recommends a small space between the value and units. In addition, follow the below conventions for formatting values and units:

Decimal Separator & Digit Separation

Following the conventions of the English-speaking world, a `.` should be used to separate the decimal part of a number from the integral part, not `,`, as is common in some languages. This is because commas are already reserved for separating mathematical notation such as arguments of multivariate functions, elements of a set, and the coordinates of ordered tuples.

No punctuation should be used to separate multiples of three digits on either side of the decimal separator; instead, a small space rendered by `\,` should be used on both sides of the decimal marker when the string of digits consists of more than four or five digits. For example,

- `4321.1234` `4321.1234`
- `54\,321.123\,45` `54 321.123 45`
- `0.56789` `0.56789`
- `0.567\,89` `0.567 89`

If you use a decimal separator, you should include a digit on both sides of the separator, even if the digit is simply 0.

Powers of 10

Seeing as we are not calculators, it is preferable to fully write without abbreviation `\times 10^{n}` `\times 10^n` when scientific or engineering notation is helpful or necessary. Do not precede or follow this markdown with positive nor negative spaces; `\times` takes care of that on its own.

Nevertheless, if necessary, use an upright variant of the letter ‘E’ or ‘e’ to indicate order of magnitude, such as

- `\mathrm{E}\,6` `E 6`
- `\scriptsize{\mathrm{E}}\,,\,\normalsize{6}` `E 6`
- `\mathrm{e}\,6` `e 6`

A small space on either side is perfectly fine and recommended

- `\mathrm{m}` m
- `\mathrm{kg}` kg
- `\mathrm{ft.}` ft.

Do not use a period with symbolic units; do use a period with abbreviated units.

Units with a Dot Multiplier

Multiplied units conjoined by a dot should follow the form `\mathrm{u}\!\!\cdot\!\!\mathrm{v}` $u \cdot v$. (I have this sequence of commands saved under the keyboard shortcut `umul` on my devices.) Because of how `\cdot` is designed (i.e., to separate numbers), the small negative space `\!` on either side maintains uniform spacing throughout the whole compound unit. For example,

- `\mathrm{N}\!\!\cdot\!\!\mathrm{m}` N·m
- `\mathrm{s}\!\!\cdot\!\!\mathrm{A}` s·A

Do not use `\times` \times as a separator.

Units with a Solidus Separator

Divided units conjoined by a solidus should follow the form `\left.\mathrm{u}\middle/\mathrm{v}\right.` u/v . (I have this sequence of commands saved under the keyboard shortcut `udiv` on my devices.) The extra markdown is to ensure that solidus stretches the entire height of the unit, especially when exponents are involved. For example,

- `\left.\mathrm{J}\middle/\mathrm{s}\right.` J/s
- `\left.\mathrm{m}\middle/\mathrm{s}^2\right.` m/s²

You may include small negative spaces `\!` on either side of the solidus if you please.

Exponents

Exponents can be rendered with the standard MathJax markdown. The carat and number should immediately follow the closing brace of the `\mathrm{}` argument. For example,

- `\mathrm{m}^2` m²

Exponents in Place of Separators

If you prefer to use no separators and only powers, separator each single `\mathrm{}` with a small space `\,` and use exponents as necessary. For example,

- `\mathrm{m}\,,\mathrm{s}^{-2}` m s^{-2}
- `\mathrm{s}^{-1}\,,\mathrm{mol}` $\text{s}^{-1} \text{mol}$

Examples in Context

```
\mu_0=4\pi\times10^{-7} \ \left.\mathrm{\mathrm{T}\!\cdot\!\mathrm{m}}\middle/\mathrm{A}\right.
```

$$\mu_0 = 4\pi \times 10^{-7} \text{ T}\cdot\text{m/A}$$

```
180^\circ=\pi \ \mathrm{rad}
```

$$180^\circ = \pi \text{ rad}$$

```
N_A = 6.022\times10^{23} \ \mathrm{mol}^{-1}
```

$$N_A = 6.022 \times 10^{23} \text{ mol}^{-1}$$

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2 revs

Chase Ryan Taylor