

Typst Math for Undergrads

This is a Typst port of *LaTeX Math for Undergrads* by Jim Hefferon. The original version is available at <https://gitlab.com/jim.hefferon/undergradmath>.

Meaning of annotations

2023-03-25 ✕

This is unavailable. Last check date is 2023-03-25.



Get this in a tricky way. Need a simpler method.

No idea 😞

Don't know how to get this.

Rule One Any mathematics at all, even a single character, gets a mathematical setting. Thus, for “the value of x is 7” enter the value of $\$x\$$ is $\$7\$$.

Template Your document should contain at least this.

-- document body here --

Common constructs

x^2 $x^{\wedge}2$ $\sqrt{2}$, $\sqrt[3]{2}$ $\text{sqrt}(2)$, $\text{root}(n, 3)$
 $x_{i,j}$ $x_{\text{~}(i, j)}$ $\frac{2}{3}$, $2/3$ $2 \div 3$, $2 \setminus 3$ or $2 \text{ slash } 3$

Calligraphic letters Use as in $\text{\textit{cal}}(A)$.

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

Getting script letters is 2023-03-25 ✕.

Greek

α alpha	ξ, Ξ xi, Xi
β beta	\omicron omicron
γ, Γ gamma, Gamma	π, Π pi, Pi
δ, Δ delta, Delta	ϖ pi.alt
ϵ epsilon.alt	ρ rho
ε epsilon	ϱ rho.alt
ζ zeta	σ, Σ sigma, Sigma
η eta	ς \u{03C2} ☹
θ, Θ theta, Theta	τ tau
ϑ theta.alt	υ, Υ upsilon, Upsilon
ι iota	ϕ, Φ phi.alt, Phi
κ K	φ phi
λ, Λ lambda, Lambda	χ chi
μ mu	ψ, Ψ psi, Psi
ν nu	ω, Ω omega, Omega

Sets and logic

\cup union	\mathbb{R} RR, bb(R)	\forall forall
\cap sect	\mathbb{Z} ZZ, bb(Z)	\exists exists
\subset subset	\mathbb{Q} QQ, bb(Q)	\neg not
\subseteq subset.eq	\mathbb{N} NN, bb(N)	\vee or
\supset supset	\mathbb{C} CC, bb(C)	\wedge and
\supseteq supset.eq	\emptyset ☹	\vdash tack.r
\in in	\emptyset nothing	\models models
\notin in.not	\aleph alef	\setminus without

Negate an operator, as in $\not\subset$, with `subset.not`. Get the set complement A^c with `A^(sans(c))` (or A^c with `A^(complement)`, or \overline{A} with `overline(A)`).

Remark: The character \emptyset from `\varnothing` in $\text{\texttt{LaTeX}}$ is an alternative character of \emptyset from `nothing` in Typst (`\emptyset` in $\text{\texttt{LaTeX}}$). See the Version 3.93 section of README at <https://www.ctan.org/tex-archive/fonts/>

`newcomputermodern`. You can create the `\varnothing` character with a `let` binding using specific fonts.

Decorations

f' <code>f', f prime</code>	\dot{a} <code>dot(a)</code>	\tilde{a} <code>tilde(a)</code>
f'' <code>f prime.double</code>	\ddot{a} <code>diaer(a)</code>	\bar{a} <code>macron(a)</code>
Σ^* <code>Sigma^*</code>	\hat{a} <code>hat(a)</code>	\vec{a} <code>arrow(a)</code>

If the decorated letter is i or j then some decorations need `\u{1D6A4}` ☹ and `\u{1D6A5}` ☹, as in \vec{i} with `arrow(\u{1D6A4})`. Some authors use boldface for vectors: `bold(x)`.

Entering `overline(x + y)` produces $\overline{x + y}$, and `hat(x + y)` gives $\hat{x + y}$. Comment on an expression as here (there is also `overbrace(...)`).

$\underbrace{x + y}_{|A|}$ `underbrace(x + y, |A|)`

Dots Use low dots in a list $\{0, 1, 2, \dots\}$, entered as `{0, 1, 2, ...}`. Use centered dots in a sum or product $1 + \dots + 100$, entered as `1 + dots.h.c + 100`. You can also get vertical dots `dots.v`, diagonal dots `dots.down` and anti-diagonal dots `dots.up`.

Roman names Just type them!

\sin <code>sin</code>	\sinh <code>sinh</code>	\arcsin <code>arcsin</code>
\cos <code>cos</code>	\cosh <code>cosh</code>	\arccos <code>arccos</code>
\tan <code>tan</code>	\tanh <code>tanh</code>	\arctan <code>arctan</code>
\sec <code>sec</code>	\coth <code>coth</code>	\min <code>min</code>
\csc <code>csc</code>	\det <code>det</code>	\max <code>max</code>
\cot <code>cot</code>	\dim <code>dim</code>	\inf <code>inf</code>
\exp <code>exp</code>	\ker <code>ker</code>	\sup <code>sup</code>
\log <code>log</code>	\deg <code>deg</code>	\liminf <code>liminf</code>
\ln <code>ln</code>	\arg <code>arg</code>	\limsup <code>limsup</code>
\lg <code>lg</code>	\gcd <code>gcd</code>	\lim <code>lim</code>

Other symbols

$<$ <code><, lt</code>	\angle <code>angle</code>	\cdot <code>dot.op</code>
\leq <code><=, lt.eq</code>	\sphericalangle <code>angle.arc</code>	\pm <code>plus.minus</code>
$>$ <code>>, gt</code>	ℓ <code>ell</code>	\mp <code>minus.plus</code>
\geq <code>>=, gt.eq</code>	\parallel <code>parallel</code>	\times <code>times</code>
\neq <code>eq.not</code>	45° <code>45 degree</code>	\div <code>div</code>
\ll <code><<, lt.double</code>	\cong <code>tilde.eqq</code>	$*$ <code>*, ast.op</code>
\gg <code>>>, gt.double</code>	\ncong <code>tilde.eqq.not</code>	$ $ <code>divides</code>
\approx <code>approx</code>	\sim <code>tilde.op</code>	\nmid <code>divides.not</code>
\asymp <code>\u{224D}</code> ☹	\simeq <code>tilde.eq</code>	$n!$ <code>n!</code>
\equiv <code>ident</code>	\simeq <code>tilde.not</code>	∂ <code>diff</code>
\prec <code>prec</code>	\oplus <code>plus.circle</code>	∇ <code> nabla</code>
\preceq <code>prec.eq</code>	\ominus <code>minus.circle</code>	\hbar <code>planck.reduce</code>
\succ <code>succ</code>	\odot <code>dot.circle</code>	\circ <code>circle.stroked.tiny</code>
\succeq <code>succ.eq</code>	\otimes <code>times.circle</code>	\star <code>star.op</code>
\propto <code>prop</code>	\oslash <code>\u{2298}</code> ☹	$\sqrt{\quad}$ <code>sqrt("")</code>
No idea 😞	\upharpoonright <code>harpoon.tr</code>	\checkmark <code>checkmark</code>

Use `a divides b` for the divides relation, $a \mid b$, and `a divides.not b` for the negation, $a \nmid b$. Use `|` to get set builder notation $\{a \in S \mid a \text{ is odd}\}$ with `{a in S | a "is odd"}`.

Arrows

\rightarrow <code>->, arrow.r</code>	\mapsto <code> ->, arrow.r.bar</code>
\nrightarrow <code>arrow.r.not</code>	\mapsto <code>arrow.r.long.bar</code>
\longrightarrow <code>arrow.r.long</code>	\leftarrow <code><-, arrow.l</code>
\Rightarrow <code>=>, arrow.r.double</code>	\leftrightarrow <code><->, arrow.l.r</code>
\nRightarrow <code>arrow.r.double.not</code>	\downarrow <code>arrow.b</code>

\Rightarrow `arrow.r.double.long` \uparrow `arrow.t`
 \rightsquigarrow `arrow.squiggly` \Downarrow `arrow.t.b`

The right arrows in the first column have matching left arrows, such as `arrow.l.not`, and there are some other matches for down arrows, etc.

Variable-sized operators The summation $\sum_{j=0}^3 j^2$ `sum_(j = 0)^3 j^2` and the integral $\int_{x=0}^3 x^2 dx$ `integral_(x = 0)^3 x^2 dif x` expand when displayed.

$$\sum_{j=0}^3 j^2 \quad \int_{x=0}^3 x^2 dx$$

These do the same.

$$\int \text{integral} \quad \iiint \text{integral.triple} \quad \bigcup \text{union.big} \\ \iint \text{integral.double} \quad \oint \text{integral.cont} \quad \bigcap \text{sect.big}$$

Fences

$$\begin{array}{lll} () & \langle \rangle & \text{angle.l angle.r} \\ [] & \lfloor \rfloor & \text{floor("")} \\ \{\} & \lceil \rceil & \text{ceil("")} \end{array} \quad \begin{array}{l} || \text{abs("")} \\ ||| \text{norm("")} \end{array}$$

Fix the size with the `lr` function.

$$\left[\sum_{k=0}^n e^{k^2} \right] \text{lr}([\text{sum}_(k = 0)^n e^{(k^2)}], \text{size: \#50\%})$$

To have them grow with the enclosed formula, also use the `lr` function.


$$\left\langle i, 2^{2^i} \right\rangle \text{lr}(\text{angle.l } i, 2^{(2^i)} \text{ angle.r})$$

Fences scale by default if entered directly as codepoints, and don't scale automatically if entered as symbol notation.

$$\left(\frac{1}{n^\alpha} \right) (1 / n^{(\alpha)}) \\ \left(\frac{1}{n^\alpha} \right) \text{paren.l } 1 / n^{(\alpha)} \text{paren.r}$$

The `lr` function also allows to scale unmatched delimiters and one-side fences.

$$\left. \frac{df}{dx} \right|_{x_0} \text{lr}(\text{frac}(dif f, dif x) |)_{(x_0)}$$

Arrays, Matrices In Typst, `array` is a sequence of values, while in \LaTeX , `array` is a matrix without fences, which is **2023-03-25**  in Typst.

Definition by cases can be easily obtained with the `cases` function.

$$f_n = \begin{cases} a & \text{if } n = 0 \\ r \cdot f_{n-1} & \text{else} \end{cases} \quad \begin{array}{l} \$ f_n = \text{cases}(\\ \quad a \ \&"if" \ n = 0, \\ \quad r \ \text{dot.op} \ f_n - 1 \ \&"else" \\) \$ \end{array}$$

Get a matrix with the `mat` function. You can pass an array to it.

$$\begin{pmatrix} a & b \\ c & d \end{pmatrix} \quad \$ \text{mat}(a, b; c, d) \$$$

For the determinant use $|A|$, text operator `det` `det` or `#set math.mat(delim: "|")`.

Spacing in mathematics Improve $\sqrt{2}x$ to $\sqrt{2}x$ with a thin space, as in `sqrt(2) thin x`. Slightly wider are `medium` and `thick` (the three are in ratio 3 : 4 : 5). Bigger space is `quad` for $\rightarrow \leftarrow$, which is useful between parts of a display. Get arbitrary space with the `h` function. For example, use `#h(2em)` for \quad in \LaTeX and `#h(-0.1667em)` for \backslash .

Displayed equations Display equations in a block level using `$... $` with at least one space separating the math content and the `$`.

$$S = k \cdot \lg W \quad \$ S = k \ \text{dot.op} \ \lg \ W \$$$

You can break into multiple lines.

$$\sin(x) = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \dots$$

$$\$ \sin(x) = x - x^3 / 3! \backslash + x^5 / 5! - \text{dots.h.c} \$$$

Align equations using `&`

$$\begin{array}{ll} \nabla \cdot \boldsymbol{D} = \rho & \$ \text{nabla dot.op bold(D) \&= rho \backslash} \\ \nabla \cdot \boldsymbol{B} = 0 & \text{nabla dot.op bold(B) \&= 0 \$} \end{array}$$

(the left or right side of an alignment can be empty). Get a numbered version by `#set math.equation(numbering: ..)`.

Calculus examples The last three here are display style.

$$\begin{array}{ll} f: \mathbb{R} \rightarrow \mathbb{R} & f: \mathbb{R} \rightarrow \mathbb{R} \\ 9.8 \text{ m/s}^2 & "9.8" \text{ "m/s"}^2 \end{array}$$

$$\lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h} \quad \lim_{(h \rightarrow 0)} (f(x+h) - f(x)) / h$$

$$\int x^2 dx = x^3 / 3 + C \quad \text{integral } x^2 \text{ dif } x = x^3 \backslash / 3 + C$$

$$\nabla = i \frac{d}{dx} + j \frac{d}{dy} + k \frac{d}{dz} \quad \text{nabla} = \text{bold}(i) \text{ dif } / (\text{dif } x) + \text{bold}(j) \text{ dif } / (\text{dif } y) + \text{bold}(k) \text{ dif } / (\text{dif } z)$$

Discrete mathematics examples For modulo, there is a symbol \equiv from `ident` and a text operator `mod` from `mod`.

For combinations the binomial symbol $\binom{n}{k}$ is from `binom(n, k)`. This resizes to be bigger in a display.

For permutations use n^r from `n^(underline(r))` (some authors use $P(n, r)$, or ${}_nP_r$ from `"_n P_r`).

Statistics examples

$$\sigma^2 = \sqrt{\sum (x_i - \mu)^2 / N} \quad \text{sigma}^2 = \text{sqrt}(\text{sum}(x_i - \mu)^2 \backslash / N)$$

$$E(X) = \mu_X = \sum (x_i - P(x_i)) \quad E(X) = \mu_X = \text{sum}(x_i - P(x_i))$$

The probability density of the normal distribution

$$\frac{1}{\sqrt{2\sigma^2\pi}} e^{-\frac{(x-\mu)^2}{2\sigma^2}}$$

comes from this.

$$\frac{1}{\sqrt{2 \text{ sigma}^2 \pi}} e^{(- (x - \mu)^2 / (2 \text{ sigma}^2))}$$

For more See also the Typst Documentation at <https://typst.app/docs>.