

lymath package: semantic low level math formulas

(developped and tested on Mac OS X)

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1 Introduction

The package `lymath` is a set of semantic macros to write elementary mathematic formulas. Here is an example of L^AT_EX code that you can use with `lymath`.

% Without lyxam

Knowing that $\frac{df}{dx} = 4 \cos(x^2)$, we have:
 $\int_a^b \cos(x^2) dx = \left[\frac{1}{4} f(x) \right]_a^b$.

% With lyxam

Knowing that $\frac{df}{dx} = 4 \cos(x^2)$, we have:
 $\int_a^b \cos(x^2) dx = \hook{\frac{1}{4} f(x)}{a}{b}$.

2 Miscellaneous

2.1 Semi-colon and spacing with the french option of babel

Only `\textbf{if}` you use `\texttt{babel}` with the option `\texttt{francais}}`, then you will see the same spacing around the semi-colon in $A(x;y)$. Que c'est beau !

Only **if you use babel with the option francais**, then you will see the same spacing around the semi-colon in $A(x;y)$. Que c'est beau !

3 Sets

3.1 Different kind of sets

3.1.1 Sets for geometry

Example of use

You can semantically write $\text{\textbackslash geoset{C}}$, $\text{\textbackslash geoset{D}}$ and $\text{\textbackslash geoset{d}}$ but you can not write things like $\text{\textbackslash verb+}\text{\textbackslash geoset{ABC}}$.

You can semantically write \mathcal{C} , \mathcal{D} and \mathcal{d} but you can not write things like $\text{\textbackslash geoset{ABC}}$.

Technical ID

$\text{\textbackslash geoset}$ (1 Argument)

— **Argument**: one single ASCII letter indicating a geometrical set.

3.1.2 Sets for probability

Example of use

You can semantically write $\text{\textbackslash probaset{E}}$ and $\text{\textbackslash probaset{G}}$ but you can not write things like $\text{\textbackslash verb+}\text{\textbackslash probaset{ABC}}$.

You can semantically write \mathcal{E} and \mathcal{G} but you can not write things like $\text{\textbackslash probaset{ABC}}$.

Technical ID

$\text{\textbackslash probaset}$ (1 Argument)

— **Argument**: one single upper ASCII upper letter indicating a probabilistic set.

3.1.3 Sets for rings and fields theory

Example of use

You can semantically write $\text{\textbackslash fieldset{A}}$, $\text{\textbackslash fieldset{K}}$, $\text{\textbackslash fieldset{h}}$ and $\text{\textbackslash fieldset{k}}$, but you can't write things like $\text{\textbackslash verb+}\text{\textbackslash fieldset{ABC}}$.

You can semantically write \mathbb{A} , \mathbb{K} , \mathbb{h} and \mathbb{k} , but you can't write things like $\text{\textbackslash fieldset{ABC}}$.

Technical ID

$\text{\textbackslash fieldset}$ (1 Argument)

— **Argument**: either one of the letters \mathbb{h} and \mathbb{k} , or one single upper ASCII upper letter indicating a field or ring like set.

3.1.4 Classical sets

You can directly use `\nullset`, `\NN`, `\ZZ`, `\DD`, `\QQ`, `\RR`, `\CC`, `\HH` and `\OO`.

You can directly use \emptyset , \mathbb{N} , \mathbb{Z} , \mathbb{D} , \mathbb{Q} , \mathbb{R} , \mathbb{C} , \mathbb{H} and \mathbb{O} .

3.1.5 Classical sets with suffixes

It is easy to type `\RRn`, `\RRp`, `\RRs`, `\RRsn` and `\RRsp`.

It is easy to type \mathbb{R}_- , \mathbb{R}_+ , \mathbb{R}^* , \mathbb{R}_-^* and \mathbb{R}_+^* .

We have used suffixes **n** for **N**egative, **p** for **P**ositive, and **s** for **S**tar with the additional composite suffixes **sn** et **sp**.

Note that you can't use `\CCn` for \mathbb{C}_- because the set \mathbb{C} doesn't have any standard powerful ordered structure. Take a look at the next section to see how to write \mathbb{C}_- if you need it.

The following table shows when you can add one of the suffixes **n**, **p**, **s**, **sn** and **sp**.

Table 1: Suffixes

	n	p	s	sn	sp
N			×		
Z	×	×	×	×	×
D	×	×	×	×	×
Q	×	×	×	×	×
R	×	×	×	×	×
C			×		
H			×		
O			×		

3.1.6 Suffixes on demand

Example of use

You can indeed write things like `\specialset{\CC}{n}` or `\specialset{\HH}{sp}`. There is also `\specialset*{\probaset{P}}{n}` with another formatting.

You can indeed write things like \mathbb{C}_- or \mathbb{H}_+^* . There is also $\mathcal{P}_{\leq 0}$ with another formatting.

Technical IDs

`\specialset` (2 Arguments)

`\specialset*` (2 Arguments)

- Argument #1: the set to be "suffixed".
- Argument #2: one of the suffixes n, p, s, sn and sp.

3.2 Intervals

3.2.1 Real intervals - French (?) notation

Example of use #1

In $\backslash\mathrm{intervalOC}\{a\}\{b\} =]a ; b[= \backslash\mathrm{intervalOC}\{a\}\{b\}$, you can see that the macro used solves a spacing problem, and that the delimiters are a little bigger.

% The syntax refers to O-pened and C-losed but CC and OO are reduced to C and O.

In $]a;b[=]a;b[=]a;b[$, you can see that the macro used solves a spacing problem, and that the delimiters are a little bigger.

Example of use #2

You can use the star version of a macro if you want the delimiters to stretch vertically.

$$\begin{aligned} \backslash\displaystyle \backslash\mathrm{intervalC}\{ \frac{1}{2} \}\{ 1^{2^3} \} \\ = [\frac{1}{2} ; 1^{2^3}] \\ = \backslash\mathrm{intervalC*}\{ \frac{1}{2} \}\{ 1^{2^3} \} \end{aligned}$$

You can use the star version of a macro if you want the delimiters to stretch vertically.

$$\left[\frac{1}{2}; 1^{2^3}\right] = \left[\frac{1}{2}; 1^{2^3}\right] = \left[\frac{1}{2}; 1^{2^3}\right]$$

Technical IDs

For all the macros above, the star version produces intervals with delimiters that fit vertically with the bounds of the interval.

$\backslash\mathrm{intervalCO}$ (2 Arguments)

$\backslash\mathrm{intervalCO*}$ (2 Arguments)

— Argument #1: lower bound a of the interval $[a;b[$.

— Argument #2: upper bound b of the interval $[a;b[$.

$\backslash\mathrm{intervalC}$ (2 Arguments)

$\backslash\mathrm{intervalC*}$ (2 Arguments)

— Argument #1: lower bound a of the interval $[a;b]$.

— Argument #2: upper bound b of the interval $[a;b]$.

$\backslash\mathrm{intervalO}$ (2 Arguments)

$\backslash\mathrm{intervalO*}$ (2 Arguments)

- Argument #1: lower bound a of the interval $]a; b[$.
- Argument #2: upper bound b of the interval $]a; b[$.

`\intervalOC (2 Arguments)`

`\intervalOC* (2 Arguments)`

- Argument #1: lower bound a of the interval $]a; b]$.
- Argument #2: upper bound b of the interval $]a; b]$.

3.2.2 Real intervals - American notation

Example of use

A semi-closed interval $\text{\textbackslash intervalPC\{a\}\{b\}} = (a ; b]$ and an opened one $\text{\textbackslash intervalP\{a\}\{b\}} = (a ; b)$.

% The syntax refers to P-arenthesis.

A semi-closed interval $(a; b] = (a; b]$ and an opened one $(a; b) = (a; b)$.

Technical IDs

For all the macros above, the star version produces intervals with delimiters that fit vertically with the bounds of the interval.

`\intervalCP (2 Arguments)`

`\intervalCP* (2 Arguments)`

- Argument #1: lower bound a of the interval $[a; b)$.
- Argument #2: upper bound b of the interval $[a; b)$.

`\intervalP (2 Arguments)`

`\intervalP* (2 Arguments)`

- Argument #1: lower bound a of the interval $(a; b)$.
- Argument #2: upper bound b of the interval $(a; b)$.

`\intervalPC (2 Arguments)`

`\intervalPC* (2 Arguments)`

- Argument #1: lower bound a of the interval $(a; b]$.
- Argument #2: upper bound b of the interval $(a; b]$.

3.2.3 Discrete intervals of integers

Example of use

By definition, $\backslash\mathrm{ZintervalC}\{-1\}\{4\} = \{-1 ; 0 ; 1 ; 2 ; 3 ; 4 \}$. So we also have $\backslash\mathrm{ZintervalC}\{-1\}\{4\} = \backslash\mathrm{Zinterval0}\{-2\}\{5\}$.

% The syntax refers to \mathbb{Z} the set of integers.

By definition, $\llbracket -1; 4 \rrbracket = \{-1; 0; 1; 2; 3; 4\}$. So we also have $\llbracket -1; 4 \rrbracket = \llbracket -2; 5 \rrbracket$.

Technical IDs

For all the macros above, the star version produces intervals with delimiters that fit vertically with the bounds of the interval.

$\backslash\mathrm{ZintervalC0}$ (2 Arguments)

$\backslash\mathrm{ZintervalC0}^*$ (2 Arguments)

— Argument #1: lower bound a of the interval $\llbracket a; b \rrbracket$.

— Argument #2: upper bound b of the interval $\llbracket a; b \rrbracket$.

$\backslash\mathrm{ZintervalC}$ (2 Arguments)

$\backslash\mathrm{ZintervalC}^*$ (2 Arguments)

— Argument #1: lower bound a of the interval $\llbracket a; b \rrbracket$.

— Argument #2: upper bound b of the interval $\llbracket a; b \rrbracket$.

$\backslash\mathrm{Zinterval0}$ (2 Arguments)

$\backslash\mathrm{Zinterval0}^*$ (2 Arguments)

— Argument #1: lower bound a of the interval $\llbracket a; b \rrbracket$.

— Argument #2: upper bound b of the interval $\llbracket a; b \rrbracket$.

$\backslash\mathrm{Zinterval0C}$ (2 Arguments)

$\backslash\mathrm{Zinterval0C}^*$ (2 Arguments)

— Argument #1: lower bound a of the interval $\llbracket a; b \rrbracket$.

— Argument #2: upper bound b of the interval $\llbracket a; b \rrbracket$.

4 Analysis

4.1 Constants

4.1.1 Classical constants

Complete list

List of all classical constants where $\tau = \frac{\pi}{2}$ is the youngest one: γ , π , τ , e , i , j and k .

List of all classical constants where $\tau = \frac{\pi}{2}$ is the youngest one: γ , π , τ , e , i , j and k .

Remark. Take care that $\{\Large \pi \neq \pi\}$ produces $\pi \neq \pi$. As you can see, the symbols are not the same. Indeed, this is true for all the greek constants.

4.1.2 User's latine constants

Example of use

It is easy to write $\text{a} x^2 + \text{b} x + \text{c}$ instead of $a x^2 + b x + c$ such as to stress the fact that a , b and c are constants.

It is easy to write $\text{a}x^2 + \text{b}x + \text{c}$ instead of $ax^2 + bx + c$ such as to stress the fact that a , b and c are constants.

Technical ID

`\ct` (1 Argument)

— **Argument:** a latine text, and not a formula, indicated one constant.

4.2 Special functions

4.2.1 Some examples of use

Some additional special functions : $\text{ch } x \neq \text{ch } x$, $\text{ppcm}(x;y)$, $\lg x = \log_2 x$ and $\exp_6 y$.

Some additional special functions : $\text{ch } x \neq \text{ch } x$, $\text{ppcm}(x;y)$, $\lg x = \log_2 x$ and $\exp_6 y$.

4.2.2 Functions without parameter

All the following macros don't have any parameter.

<code>\pgcd</code>	<code>\ppcm</code>	<code>\ch</code>	<code>\sh</code>
<code>\th</code>	<code>\ach</code>	<code>\ash</code>	<code>\ath</code>
<code>\arccosh</code>	<code>\arcsinh</code>	<code>\arctanh</code>	<code>\acos</code>
<code>\asin</code>	<code>\atan</code>		

4.2.3 Functions with parameters

The complete list

All the following macros have at least one parameter.

`\expb` (1 parameter) `\logb` (1 parameter)

Technical IDs

`\expb` (1 Argument)

`\logb` (1 Argument)

— **Argument**: the base of the exponential or the logarithm

4.3 Extended notations for special sequences

Example of use

Sometimes we need to write $\text{\seqplus{F}{1}{2}}$ or $\text{\hypergeo{F}{1}{2}}$ and crazy -wo-men really (?) love $\text{\suprageo{F}{1}{2}{3}{4}}$.

Sometimes we need to write F_1^2 or ${}_1F_2$ and crazy -wo-men really (?) love ${}_1F_2^3$.

Technical IDs

`\seqplus` (2 Arguments)

— **Argument #1**: the right exponent like expression.

— **Argument #2**: the right indice.

`\hypergeo` (2 Arguments)

— **Argument #1**: the left indice.

— **Argument #2**: the right indice.

`\suprageo` (4 Arguments)

— **Argument #1**: the left indice.

— **Argument #2**: the right indice.

— **Argument #3**: the right exponent.

— **Argument #4**: the left exponent.

4.4 Differential calculus

4.4.1 The ∂ and d operators

Example of use

You can write $\text{\dd{x}}$ and $\text{\pp{t}}$ and also $\text{\dd[5]{x}}$ or $\text{\pp[n]{x}}$.

You can write dx and ∂t and also d^5x or $\partial^n x$.

Technical IDs

`\dd [1 Option] (1 Argument)`

`\pp [1 Option] (1 Argument)`

- **Option**: if used, this argument will be the exponent of the symbol ∂ or d .
- **Argument**: the variable of differentiation at the right of the symbol ∂ or d .

4.4.2 Total derivation

Example of use #1

```
\displaystyle f'(a)
      = \derpow{f} (a)
      = \derfrac{f}{x} (a)
      = \dersub{f}{x} (a)
```

$$f'(a) = f^{(1)}(a) = \frac{df}{dx}(a) = d_x f(a)$$

Example of use #2

```
\displaystyle f'''(a)
      = \derpow[3]{f} (a)
      = \derfrac[3]{f}{x} (a)
      = \dersub[3]{f}{x} (a)
```

and

```
\displaystyle \cos''' a = \derfrac[3]{\cos}{x} (a).
```

$$f'''(a) = f^{(3)}(a) = \frac{d^3 f}{dx^3}(a) = d_x^3 f(a) \text{ and } \cos''' a = \frac{d^3 \cos}{dx^3}(a).$$

Example of use #3

If `\displaystyle f(x) = \frac{1}{x^2+3}`, then we can write :

```
\displaystyle \derpow[3]{f} (a)
      = \derfrac*[3]{\left( \frac{1}{x^2+3} \right)}{x} (a).
```

$$\text{If } f(x) = \frac{1}{x^2+3}, \text{ then we can write : } f^{(3)}(a) = \frac{d^3}{dx^3} \left(\frac{1}{x^2+3} \right) (a).$$

Technical IDs

`\derpow [1 Option] (1 Argument)`

- **Option**: if used, this argument will be the exponent of derivation put inside braces.
- **Argument**: the function to be differentiated.

`\derfrac [1 Option] (2 Arguments)`

`\derfrac* [1 Option] (2 Arguments)`

`\dersub [1 Option] (2 Arguments)`

- **Option**: if used, the exponent of derivation.
- **Argument #1**: the function to be differenciaded.
- **Argument #2**: the variable used for the derivation.

4.4.3 Partial derivation

Example of use #1

```
\displaystyle \partialfrac{f}{x} (a;b)  
= \partialsub{f}{x} (a;b)  
= \partialprime{f}{x} (a;b)$
```

$$\frac{\partial f}{\partial x}(a;b) = \partial_x f(a;b) = f'_x(a;b)$$

Example of use #2

```
\displaystyle \partialfrac[3]{G}{f^2 // v} (a;b)  
= \partialfrac{G}{f^2 // v} (a;b)  
= \partialsub{G}{f^2 // v} (a;b)  
= \partialprime{G}{f^2 // v} (a;b)$
```

$$\frac{\partial^3 G}{\partial f^2 \partial v}(a;b) = \frac{\partial G}{\partial f^2 \partial v}(a;b) = \partial_{f(2)v} G(a;b) = G'_{f(2)v}(a;b)$$

Example of use #3

If `\displaystyle f(x;y) = \frac{\cos(x y)}{x^2+y^2}`, then we can study
`\displaystyle \partialfrac[9]{f}{x^4 // y^5}`
`= \partialfrac*[9]{\left(\frac{\cos(x y)}{x^2+y^2} \right)}{x^4 //`
`y^5}$.`

$$\text{If } f(x;y) = \frac{\cos(xy)}{x^2 + y^2}, \text{ then we can study } \frac{\partial^9 f}{\partial x^4 \partial y^5} = \frac{\partial^9}{\partial x^4 \partial y^5} \left(\frac{\cos(xy)}{x^2 + y^2} \right).$$

Technical IDs

`\partialfrac [1 Option] (2 Arguments)`

`\partialfrac* [1 Option] (2 Arguments)`

- **Option**: if used, the exponent of ∂ associated to the function differenciaded.
- **Argument #1**: the function to be partially differenciaded.
- **Argument #2**: the variables used for the partial derivation. The syntax is particular : for example, `x // y^3 //` ... indicates regarding to the variables x one time, y three times... and so on.

`\partialsub (2 Arguments)`
`\partialprime (2 Arguments)`

- **Argument #1:** the function to be partially differentiated.
- **Argument #2:** the variables used for the partial derivation. The syntax is particular : for example, `x // y^3 // ...` indicates regarding to the variables x one time, y three times... and so on.

4.5 Integral calculus

4.5.1 The hook operator - 1st version

Example of use #1

By definition, $\displaystyle \int_a^b f(x) \, dx = \hook{F(x)}{a}{b}$ where $\hook{F(x)}{a}{b} = F(b) - F(a)$.

By definition, $\int_a^b f(x) \, dx = [F(x)]_a^b$ where $[F(x)]_a^b = F(b) - F(a)$.

Example of use #2

With the star version, the hooks stretch vertically like in

$$\hookstar{\frac{x-1}{5+x^2}}{a}{b}$$

$$= \hook{\frac{x-1}{5+x^2}}{a}{b}.$$

With the star version, the hooks stretch vertically like in $\left[\frac{x-1}{5+x^2} \right]_a^b = \left[\frac{x-1}{5+x^2} \right]_a^b.$

Technical IDs

`\hook (3 Arguments)`
`\hook* (3 Arguments)`

- **Argument #1:** the content inside the hooks.
- **Argument #2:** the lower bound displayed as an index.
- **Argument #3:** the upper bound displayed as an exponent.

4.5.2 The hook operator - 2nd version

Example of use #1

You can use $\vhook{F(x)}{a}{b}$ instead of $\hook{F(x)}{a}{b}$.

You can use $F(x)|_a^b$ instead of $[F(x)]_a^b$.

Example of use #2

With the star version, the left rule stretches vertically like in

```
\displaystyle \vhook*{\frac{x - 1}{5 + x^2}}{a}{b}
= \vhook{\frac{x - 1}{5 + x^2}}{a}{b}.
```

With the star version, the left rule stretches vertically like in $\frac{x-1}{5+x^2}\Big|_a^b = \frac{x-1}{5+x^2}\Big|_a^b$.

Technical IDs

`\vhook` (3 Arguments)

`\vhook*` (3 Arguments)

- **Argument #1**: the content before the vertical line | .
- **Argument #2**: the lower bound displayed as an index.
- **Argument #3**: the upper bound displayed as an exponent.

4.5.3 Several integrals

The package minimizes spacings between consecutive symbols of integration. Here is an example.

```
\displaystyle \int \int \int F(x;y;z) \, \mathrm{d}x \, \mathrm{d}y \, \mathrm{d}z
= \int_a^b \int_c^d \int_e^f F(x;y;z) \, \mathrm{d}x \, \mathrm{d}y \, \mathrm{d}z
```

$$\iiint F(x;y;z) \, \mathrm{d}x \, \mathrm{d}y \, \mathrm{d}z = \int_a^b \int_c^d \int_e^f F(x;y;z) \, \mathrm{d}x \, \mathrm{d}y \, \mathrm{d}z$$

Remark. By default, \LaTeX prints $\int \int \int F(x;y;z) \, \mathrm{d}x \, \mathrm{d}y \, \mathrm{d}z = \int_a^b \int_c^d \int_e^f F(x;y;z) \, \mathrm{d}x \, \mathrm{d}y \, \mathrm{d}z$.

4.6 Asymptotic comparisons of sequences and functions

4.6.1 The \mathcal{O} and \mathcal{o} notations

Example of use

Let's see how to use the symbols `\bigO{}` and `\smallO{}` created by Landau.

`\medskip`

You can write `\bigO{x} \neq \smallO{x}` and `e^{t + \smallO{t}} = e^{\bigO{t}}`.

Let's see how to use the symbols \mathcal{O} and \mathcal{o} created by Landau.

You can write $\mathcal{O}(x) \neq \mathcal{o}(x)$ and $e^{t+\mathcal{o}(t)} = e^{\mathcal{O}(t)}$.

Technical IDs

`\bigO (1 Argument)`

`\smallO (1 Argument)`

— **Argument:** the content inside the braces after the symbol \mathcal{O} or \mathcal{o} .

4.6.2 The Ω notation

Example of use

Let's see how to use the symbol `\bigomega{}` created by Hardy and Littlewood.

`\medskip`

`$f(n) = \bigomega\{g(n)\}$` means: `$\exists (m, n_0)$` such that
`$n \geqslant n_0$` implies `$f(n) \geqslant m g(n)$`.

Let's see how to use the symbol Ω created by Hardy and Littlewood.

$f(n) = \Omega(g(n))$ means: $\exists(m, n_0)$ such that $n \geqslant n_0$ implies $f(n) \geqslant mg(n)$.

Technical ID

`\bigomega (1 Argument)`

— **Argument:** the content inside the braces after the symbol Ω .

4.6.3 The Θ notation

Example of use

Let's see how to use the symbol `\bigtheta{}`.

`\medskip`

`$f(n) = \bigtheta\{g(n)\}$` means: `$\exists (m, M, n_0)$` such that `$n \geqslant n_0$`
implies `$m g(n) \leqslant f(n) \leqslant M g(n)$`.

Let's see how to use the symbol Θ .

$f(n) = \Theta(g(n))$ means: $\exists(m, M, n_0)$ such that $n \geqslant n_0$ implies $mg(n) \leqslant f(n) \leqslant Mg(n)$.

Technical ID

`\bigtheta (1 Argument)`

— **Argument:** the content inside the braces after the symbol Θ .

5 Geometry

5.1 Points

5.1.1 Example of use

We can call $\text{\pt{I}}$ the middle of $[\text{\pt{A}}\text{\pt{B}}]$.

We can call I the middle of [AB].

5.1.2 Technical ID

\pt (1 Argument)

— **Argument**: one text indicating the name of a point.

5.2 Vectors

5.2.1 Example of use

Here is one vector $\text{\vect{ABCDEFG}}$ using a lot of letters and you can write $\text{\vect*{e}{rot}}$ instead of $\text{\vect{e_{rot}}}$.

Here is one vector $\overrightarrow{ABCDEFG}$ using a lot of letters and you can write \vec{e}_{rot} instead of $\overrightarrow{e_{rot}}$.

5.2.2 Technical IDs

\vect (1 Argument)

— **Argument**: one text indicating the name of a vector.

\vect* (2 Arguments)

— **Argument #1**: one text indicating *up* in the name \vec{up}_{down} of a vector.

— **Argument #2**: one text indicating *down* in the name \vec{up}_{down} of a vector.

5.3 Inner angles

5.3.1 Example of use

Here is one inner angle $\text{\anglein{ABCDEFG}}$ using a lot of letters, and you can write $\text{\anglein*{A}{rot}}$ instead of $\text{\anglein{A_{rot}}}$.

Here is one inner angle $\widehat{ABCDEFG}$ using a lot of letters, and you can write \widehat{A}_{rot} instead of $\widehat{A_{rot}}$.

5.3.2 Technical IDs

`\anglein` (1 Argument)

— **Argument**: one text indicating the name of an inner angle.

`\anglein*` (2 Arguments)

— **Argument #1**: one text indicating *up* in the name \widehat{up}_{down} of an inner angle.

— **Argument #2**: one text indicating *down* in the name \widehat{up}_{down} of an inner angle.

5.4 Circular arcs

5.4.1 Example of use

Here is one arc `\arc{ABCDEF}` using a lot of letters, and you can write `\arc*{A}{rot}` instead of `\arc{A_{rot}}`.

Here is one arc \widehat{ABCDEF} using a lot of letters, and you can write \widehat{A}_{rot} instead of $\widehat{A_{rot}}$.

5.4.2 Technical IDs

`\arc` (1 Argument)

— **Argument**: one text indicating the name of a circular arc.

`\arc*` (2 Arguments)

— **Argument #1**: one text indicating *up* in the name \widehat{up}_{down} of a circular arc.

— **Argument #2**: one text indicating *down* in the name \widehat{up}_{down} of a circular arc.

6 Arithmetic

6.1 Continued fractions

6.1.1 Standard continued fractions

Example of use

It is easy to write what is just after where the inline notation seems to have been introduced by Alfred Pringsheim (the left notation is always space consuming for a better readability).

```
$ \contfrac{u_0 // u_1 // u_2 // \dots // u_n}
= \contfrac*{u_0 // u_1 // u_2 // \dots // u_n}$
```

It is easy to write what is just after where the inline notation seems to have been introduced by Alfred Pringsheim (the left notation is always space consuming for a better readability).

$$u_0 + \frac{1}{u_1 + \frac{1}{u_2 + \frac{1}{\dots + \frac{1}{u_n}}}} = u_0 + \left[\frac{1}{u_1} \right] + \left[\frac{1}{u_2} \right] + \left[\frac{1}{\dots} \right] + \left[\frac{1}{u_n} \right]$$

Technical IDs

`\contfrac` (1 Argument)

`\contfrac*` (1 Argument)

— **Argument**: all the elements of the continued fraction separated by `//`.

6.1.2 Generalized continued fractions

Example of use

You can use similar notations for generalized continued fractions :

```
$\displaystyle \contfracgene{a // b // c // d // e // f // \dots // y // z}
= \contfracgene*{a // b // c // d // e // f // \dots // y // z}$
```

You can use similar notations for generalized continued fractions :

$$a + \frac{b}{c + \frac{d}{e + \frac{f}{\dots + \frac{y}{z}}}} = a + \left[\frac{b}{c} \right] + \left[\frac{d}{e} \right] + \left[\frac{f}{\dots} \right] + \left[\frac{y}{z} \right]$$

Technical IDs

`\contfracgene` (1 Argument)

`\contfracgene*` (1 Argument)

— Argument: all the elements of the generalized continued fraction separated by `//`.

6.1.3 Single like continued fraction

Example of use

Crazy men really (?) need to write things like `$\singlecontfrac{a}{b}$`.

% The existence of this macro just comes from its use internally.

Crazy men really (?) need to write things like $\frac{a}{b}$.

Technical ID

`\singlecontfrac` (2 Arguments)

— Argument #1: the pseudo numerator

— Argument #2: the pseudo denominator

6.1.4 The \mathcal{K} operator

Example of use #1

The following notation is very closed to the one used by Carl Friedrich Gauss:

`$\displaystyle`
 `\contfracope_{k=1}^n (b_k:c_k)`
 `= \cfrac{b_1}{\contfracgene{c_1 // b_2 // c_2 // b_3 // \dots // b_n // c_n}}$`

The following notation is very closed to the one used by Carl Friedrich Gauss:

$$\mathcal{K}_{k=1}^n(b_k : c_k) = \frac{b_1}{c_1 + \frac{b_2}{c_2 + \frac{b_3}{\dots + \frac{b_n}{c_n}}}}$$

Remark. The letter \mathcal{K} comes from "kettenbruch" which means "continued fraction" in german.

Example of use #2

```

$$u_0 + \frac{1}{u_1 + \frac{1}{u_2 + \frac{1}{\dots + \frac{1}{u_n}}}}$$

```

$$u_0 + \mathcal{K}_{k=1}^n(1 : u_k) = u_0 + \frac{1}{u_1 + \frac{1}{u_2 + \frac{1}{\dots + \frac{1}{u_n}}}}$$