1 Miscellaneous

1.1 Semi-colon and spacing

```
Same spacing around the semi-colon in $A(x;y)$. So cute !
```

Same spacing around the semi-colon in $A(x\,;y)$. So cute !

2 Sets

2.1 Different kind of sets

2.1.1 Sets for geometry

Example of use

```
You can semantically write $\geoset{C}$, $\geoset{D}$ and $\geoset{d}$
but you can't write things like \verb+$\geoset{ABC}$+.
```

You can semantically write $\mathscr{C}$, $\mathscr{D}$ and $\mathscr{d}$ but you can't write things like `$\geoset{ABC}$`.

Technical IDs

`\geoset (1 Argument)`

— `Argument #1`: one single `ASCII` letter indicating a geometrical set.

2.1.2 Sets for probability

Example of use

```
You can semantically write $\probaset{E}$ and $\probaset{G}$
but you can't write things like \verb+$\probaset{ABC}$+.
```

You can semantically write $\mathcal{E}$ and $\mathcal{G}$ but you can't write things like `$\probaset{ABC}$`.

Technical IDs

`\probaset (1 Argument)`

— `Argument #1`: one single `ASCII` upper letter indicating a probabilistic set.

2.1.3 Sets for rings and fields theory

Example of use

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

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

Technical IDs

`\fieldset (1 Argument)`

— `Argument #1:` either one of the letters `h` and `k`, or one single `ASCII` upper letter indicating a field or ring like set.

2.1.4 Classical sets

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

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

2.1.5 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 `Negative`, `p` for `Positive`, and `s` for `Star` 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			×		

2.1.6 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`.

2.2 Intervals

2.2.1 Real intervals - French (?) notation

Example of use

```
In $\intervalOC{a}{b} = ]a ; b] = \intervalOC{a}{b}$, 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.

\medskip

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

$\displaystyle \intervalC{ \frac{1}{2} }{ 1^{2^{3}} }
             = [ \frac{1}{2} ; 1^{2^{3}} ]
             = \intervalC*{ \frac{1}{2} }{ 1^{2^{3}} }$
```

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

You can use the star version of a macro if you want the delimiters to stretch vertically.
$\displaystyle [\frac{1}{2}\,;1^{2^3}] = [\frac{1}{2};1^{2^3}] = \left[\frac{1}{2}\,;1^{2^3}\right]$

Technical IDs

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

`\intervalCO` (2 Arguments)
`\intervalCO*` (2 Arguments)

— `Argument #1`: lower bound a of the interval $\left[a\,;b\right[$.

— `Argument #2`: upper bound b of the interval $\left[a\,;b\right[$.

`\intervalC (2 Arguments)`
`\intervalC* (2 Arguments)`

— `Argument #1`: lower bound a of the interval $\left[a\,;b\right]$.

— `Argument #2`: upper bound b of the interval $\left[a\,;b\right]$.

`\intervalO (2 Arguments)`
`\intervalO* (2 Arguments)`

— `Argument #1`: lower bound a of the interval $\left]a\,;b\right[$.

— `Argument #2`: upper bound b of the interval $\left]a\,;b\right[$.

`\intervalOC (2 Arguments)`
`\intervalOC* (2 Arguments)`

— `Argument #1`: lower bound a of the interval $\left]a\,;b\right]$.

— `Argument #2`: upper bound b of the interval $\left]a\,;b\right]$.

2.2.2 Real intervals - American notation

Example of use

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

% The syntax refers to P-arenthesis.
```

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

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 $\left[a\,;b\right)$.

— `Argument #2`: upper bound b of the interval $\left[a\,;b\right)$.

`\intervalP (2 Arguments)`
`\intervalP* (2 Arguments)`

— `Argument #1`: lower bound a of the interval $\left(a\,;b\right)$.

— `Argument #2`: upper bound b of the interval $\left(a\,;b\right)$.

`\intervalPC (2 Arguments)`
`\intervalPC* (2 Arguments)`

— `Argument #1`: lower bound a of the interval $\left(a\,;b\right]$.

— `Argument #2`: upper bound b of the interval $\left(a\,;b\right]$.

2.2.3 Discrete intervals of integers

Example of use

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

% The syntax refers to Z the set of integers.
```

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

Technical IDs

`\ZintervalCO` (2 Arguments)
`\ZintervalCO*` (2 Arguments)

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

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

`\ZintervalC` (2 Arguments)
`\ZintervalC*` (2 Arguments)

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

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

`\ZintervalO` (2 Arguments)
`\ZintervalO*` (2 Arguments)

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

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

`\ZintervalOC` (2 Arguments)
`\ZintervalOC*` (2 Arguments)

— `Argument #1`: lower bound a of the interval $]\!]a\,;b]\!]$.

— `Argument #2`: upper bound b of the interval $]\!]a\,;b]\!]$.

3 Analysis

3.1 Constants

3.1.1 Classical constants

Complete list

```
List of all classical constants where $\ttau = \frac{\ppi}{2}$ is the youngest one:
$\ggamma$, $\ppi$, $\ttau$, $\ee$, $\ii$, $\jj$ and $\kk$.
```

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

Remark

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

3.1.2 User's latine constants

Example of use

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

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

Technical IDs

`\ct (1 Argument)`

— `Argument #1:` a latine text, and not a formula, indicated one constant.

3.2 Special functions

3.2.1 Some examples of use

```
Some additional special functions :
$\ch x \neq ch x$, $\ppcm(x;y)$, $\lg x =\logb{2} x$ and $\expb{6} y$.
```

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

3.2.2 Functions without parameter

All the following macros don't have any parameter.

`\pgcd`	`\ppcm`	`\ch`	`\sh`
`\th`	`\ach`	`\ash`	`\ath`
`\arccosh`	`\arcsinh`	`\arctanh`	`\acos`
`\asin`	`\atan`		

3.2.3 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 #1:` the base of the exponential or the logarithm

3.3 Extended notations for special sequences

Example of use

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

Sometimes we need to write F_1^2 or ${}_1F_2$ and crazy men really (?) love ${}_1^4F_2^3$.

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.

3.4 Differential calculus

3.4.1 The ∂ and d operators

Example of use

```
You can write $\dd{x}$ and $\pp{t}$, but also $ \dd[5]{x}$ et $\pp[n]{x}$.
```

You can write $\mathrm{d}x$ and ∂t, but also $\mathrm{d}^5 x$ et $\partial^n x$.

Technical IDs

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

— `Option #1:` if used, this argument will be the exponent of the symbol ∂ or d.

— `Argument #1:` the variable of differentiation at the right of the symbol ∂ or d.

3.4.2 Total derivation

Example of use

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

$\displaystyle cos' a = \cos^{(1)}(a) = \frac{\mathrm{d}\cos}{\mathrm{d}x}(a)$ and $\displaystyle cos''' a = \cos^{(3)}(a) = \frac{\mathrm{d}^3\cos}{\mathrm{d}x^3}(a)$

Technical IDs

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

— `Option #1:` if used, this argument will be the exponent of derivation put inside braces.

— `Argument #1:` the function to be differenciated.

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

— `Option #1:` if used, the exponent of derivation.

— `Argument #1:` the function to be differenciated.

— `Argument #2:` the variable used for the derivation.

3.4.3 Partial derivation

Example of use

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

\medskip

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

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

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

Technical IDs

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

— `Option #1:` if used, the exponent of ∂ associated to the function differenciated.

— `Argument #1:` the function to be partially differenciated.

— `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 differenciated.

— `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.

3.5 Integral calculus

3.5.1 The hook operator

Example of use

```
By definition, $\displaystyle \int_{a}^{b} f(x) \dd{x} = \hook{F(x)}{a}{b}$
where $\hook{F(x)}{a}{b} = \hook*{F(x)}{a}{b} = F(b) - F(a)$.
```

By definition, $\displaystyle \int_{a}^{b} f(x)\,\mathrm{d}x = \Big[F(x)\Big]_{a}^{b}$ where $\Big[F(x)\Big]_{a}^{b} = F(x)\Big|_{a}^{b} = F(b) - F(a)$.

Technical IDs

`\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.

`\hook* (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.

3.5.2 Several integrals

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

```
$\displaystyle \int \int \int F(x;y;z) \dd{x} \dd{y} \dd{z}
= \int_{a}^{b} \int_{c}^{d} \int_{e}^{f} F(x;y;z) \dd{x} \dd{y} \dd{z}$
```

$$\int\!\!\int\!\!\int F(x\,;y\,;z)\,\mathrm{d}x\,\mathrm{d}y\,\mathrm{d}z = \int_{a}^{b}\!\!\int_{c}^{d}\!\!\int_{e}^{f} F(x\,;y\,;z)\,\mathrm{d}x\,\mathrm{d}y\,\mathrm{d}z$$

The default behavior is the following one : $\displaystyle \int \int \int F(x\,;y\,;z)\,\mathrm{d}x\,\mathrm{d}y\,\mathrm{d}z = \int_{a}^{b} \int_{c}^{d} \int_{e}^{f} F(x\,;y\,;z)\,\mathrm{d}x\,\mathrm{d}y\,\mathrm{d}z$.

3.6 Asymptotic comparisons of sequences and functions

3.6.1 The $\mathcal{O}$ and $\mathcal{o}$ notations

Example of use

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

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 #1:` the content inside the braces after the symbol $\mathcal{O}$ or $\mathcal{o}$.

3.6.2 The Ω notation

Example of use

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

$f(n) = \bigomega{g(n)}$ 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 $\mathbf{\Omega}$ created by Hardy and Littlewood.
$f(n) = \mathbf{\Omega}(g(n))$ means : $\exists(m, n_0)$ such that $n \geqslant n_0$ implies $f(n) \geqslant mg(n)$.

Technical IDs

`\bigomega (1 Argument)`

— `Argument #1:` the content inside the braces after the symbol $\mathbf{\Omega}$.

3.6.3 The Θ notation

Example of use

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

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

Technical IDs

`\bigtheta` (1 Argument)

— `Argument #1:` the content inside the braces after the symbol $\boldsymbol{\Theta}$.