The **okicmd** and **okithm** Packages

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1 The **okicmd** Package

1.1 Letters

Input	Output	LaTeX equivalent
`l`	ℓ	`\ell`
`\ell`	l	`l`
`\epsilon`	ε	`\varepsilon`
`\varepsilon`	ϵ	`\epsilon`
`\phi`	φ	`\varphi`
`\varphi`	ϕ	`\phi`

1.2 Parentheses

Input	Output	LaTeX (almost) equivalent
`\prn{\cdot}`	$(\cdot)$	`\left(\cdot\right)`
`\prn*{\cdot}`	$(\cdot)$	`(\cdot)`
`\prn[\big]{\cdot}`	$\bigl(\cdot\bigr)$	`\bigl(\cdot\bigr)`
`\prn[\Big]{\cdot}`	$\Bigl(\cdot\Bigr)$	`\Bigl(\cdot\Bigr)`
`\prn[\bigg]{\cdot}`	$\biggl(\cdot\biggr)$	`\biggl(\cdot\biggr)`
`\prn[\Bigg]{\cdot}`	$\Biggl(\cdot\Biggr)$	`\Biggl(\cdot\Biggr)`
`\curl{\cdot}`	$\{\cdot\}$	`\left\{\cdot\right\}`
`\sqbr{\cdot}`	$[\cdot]$	`\left[\cdot\right]`
`\agbr{\cdot}`	$\langle\cdot\rangle$	`\left\langle\cdot\right\rangle`
`\dbbr{\cdot}`	$\llbracket\cdot\rrbracket$	`\left\llbracket\cdot\right\rrbracket`
`\pipe{\cdot}`	$\lvert\cdot\rvert$	`\left|\cdot\right|`
`\dbpp{\cdot}`	$\lVert\cdot\rVert$	`\left|\cdot\right|`
`\floor{\cdot}`	$\lfloor\cdot\rfloor$	`\left\lfloor\cdot\right\rfloor`
`\ceil{\cdot}`	$\lceil\cdot\rceil$	`\left\lceil\cdot\right\rceil`

1.3   Logic

Input	Output	LaTeX equivalent
`\bigland`	$\bigwedge$	`\bigwedge`
`\biglor`	$\bigvee$	`\bigvee`
`a \defeq b`	$a := b$	`a \coloneqq b`
`a \eqdef b`	$b =: a$	`a \eqqcolon b`
`P \defiff Q`	$P \overset{\mathrm{def}}{\iff} Q$	`P \overset{\mathrm{def}}{\iff} Q`

1.4   Sets

Input	Output	LaTeX (almost) equivalent
`\set{a \in S}`	$\{a \in S\}$	`\left\{a \in S\right\}`
`\set{a \in S}[a^2 = 1]`	$\{a \in S \mid a^2 = 1\}$	`\left\{a \in S\mathrel{}\middle|` `\mathrel{}a^2 = 1\right\}`
`\card{X}`	$|X|$	`\left|X\right|`
`X \symdif Y`	$X \triangle Y$	`X \mathbin{\triangle} Y`
`\setN`	$\mathbb{N}$	`\mathbb{N}`
`\setZ`	$\mathbb{Z}$	`\mathbb{Z}`
`\setQ`	$\mathbb{Q}$	`\mathbb{Q}`
`\setR`	$\mathbb{R}$	`\mathbb{R}`
`\setC`	$\mathbb{C}$	`\mathbb{C}`
`\setH`	$\mathbb{H}$	`\mathbb{H}`
`\setF`	$\mathbb{F}$	`\mathbb{F}`
`\setK`	$\mathbb{K}$	`\mathbb{K}`
`\setZp`	$\mathbb{Z}_{\ge 0}$	`\mathbb{Z}_{\ge0}`
`\setQp`	$\mathbb{Q}_{\ge 0}$	`\mathbb{Q}_{\ge0}`
`\setRp`	$\mathbb{R}_{\ge 0}$	`\mathbb{R}_{\ge0}`
`\setNpp`	$\mathbb{N}_{>0}$	`\mathbb{N}_{>0}`
`\setZpp`	$\mathbb{Z}_{>0}$	`\mathbb{Z}_{>0}`
`\setQpp`	$\mathbb{Q}_{>0}$	`\mathbb{Q}_{>0}`
`\setRpp`	$\mathbb{R}_{>0}$	`\mathbb{R}_{>0}`

1.5   Maps

Input	Output	LaTeX (almost) equivalent
`\doms{X}{Y}`	$X \to Y$	`{X}\to{Y}`
`\funcdoms{f}{X}{Y}`	$f : X \to Y$	`{f}\vcentcolon{X}\to{Y}`
`\restr{f}{S}`	$f|_S$	`\left.f\right|_{S}`
`\id_K`	id_K	`\operatorname{id}_K`
`\dom f`	$\mathrm{dom}\, f$	`\operatorname{dom} f`
`\cod f`	$\mathrm{cod}\, f$	`\operatorname{cod} f`
`\supp f`	$\mathrm{supp}\, f$	`\operatorname{supp} f`

1.6 Lattices

Input	Output	LaTeX equivalent
x \meet y	$x \wedge y$	x \mathbin{\wedge} y
x \join y	$x \vee y$	x \mathbin{\vee} y
\bigmeet	$\bigwedge$	\bigwedge
\bigjoin	$\bigvee$	\bigvee

1.7 Algebra

Input	Output	LaTeX (almost) equivalent
\Hom(G)	$\mathrm{Hom}(G)$	\operatorname{Hom}(G)
\End R	$\mathrm{End}\,R$	\operatorname{End} R
\Aut_k K	$\mathrm{Aut}_k K$	\operatorname{Aut}_k K
\gen{a,b}	$\langle a,b \rangle$	\left\langle a,b\right\rangle
\gen{a,b}[ab = e]	$\langle a,b \mid ab = e \rangle$	\left\langle a,b\mathrel{}\middle| \mathrel{}ab = e\right\rangle
\abel{G}	G_{ab}	G_{\mathrm{ab}}
\comm{G}	$[G,G]$	\left[G, G\right]
\ord G	$\mathrm{ord}\,G$	\operatorname{ord} G
\sym_n	$\mathfrak{S}_n$	\mathfrak{S}_n
\sgn(\sigma)	$\mathrm{sgn}(\sigma)$	\operatorname{sgn}(\sigma)
\mult{R}	$R^\times$	R^{\times}
\M_{m,n}(R)	$\mathrm{M}_{m,n}(R)$	\operatorname{M}_{m,n}(R)
\GL_n(R)	$\mathrm{GL}_n(R)$	\operatorname{GL}_n(R)
\SL_n(R)	$\mathrm{SL}_n(R)$	\operatorname{SL}_n(R)
\O(n)	$\mathrm{O}(n)$	\operatorname{O}(n)
\SO(n)	$\mathrm{SO}(n)$	\operatorname{SO}(n)
\U(n)	$\mathrm{U}(n)$	\operatorname{U}(n)
\SU(n)	$\mathrm{SU}(n)$	\operatorname{SU}(n)
\GL(q)	$\mathrm{GL}(q)$	\operatorname{GL}(q)
L \extends K	L / K	L \mathbin{/} K

1.8 Number Theory

Input	Output	LaTeX (almost) equivalent
\abs{x}	$\lvert x \rvert$	\left|x\right|
\intset{n}	$[n]$	\left[n\right]
a \coprime b	$a \perp b$	a \mathrel{\bot} b
a \divides b	$a \mid b$	a \mid b
a \ndivides b	$a \nmid b$	a \nmid b

1.9 Linear Algebra

Input	Output	LaTeX (almost) equivalent
`\tr A`	$\operatorname{tr} A$	`\operatorname{tr} A`
`\rank A`	$\operatorname{rank} A$	`\operatorname{rank} A`
`\trank A`	$\text{t-rank}\, A$	`\operatorname{t-rank} A`
`\Pf A`	$\operatorname{Pf} A$	`\operatorname{Pf} A`
`\diag(a_1,\dotsc,a_n)`	$\operatorname{diag}(a_1,\ldots,a_n)$	`\operatorname{diag}` `(a_1,\dotsc,a_n)`
`\blockdiag(A_1,\dotsc,A_n)`	$\text{block-diag}(A_1,\ldots,A_n)$	`\operatorname{block-diag}` `(A_1,\dotsc,A_n)`
`\vectorize(A)`	$\operatorname{vec}(A)$	`\operatorname{vectorize}(A)`
`\Row(A)`	$\operatorname{Row}(A)$	`\operatorname{Row}(A)`
`\Col(A)`	$\operatorname{Col}(A)$	`\operatorname{Col}(A)`
`\onevec`	$\mathbb{1}$	`\mathds{1}`
`\trsp{A}`	$A^\top$	`A^\top`
`\adjo{A}`	A^*	`A^*`
`\inpr{x}{y}`	$\langle x,y\rangle$	`\left\langle{x},{y}` `\right\rangle`

1.10 Analysis

Input	Output	LaTeX (almost) equivalent
`\intoo{a,b}`	(a,b)	`\left(a,b\right)`
`\intoc{a,b}`	$(a,b]$	`\left(a,b\right]`
`\intco{a,b}`	$[a,b)$	`\left[a,b\right)`
`\intcc{a,b}`	$[a,b]$	`\left[a,b\right]`
`\e`	e	`\mathrm{e}`
`\d`	d	`\mathrm{d}`
`\dif{f}{x}`	$\frac{\mathrm{d}f}{\mathrm{d}x}$	`\frac{\mathrm{d} f}{\mathrm{d} x}`
`\pdif{f}{x}`	$\frac{\partial f}{\partial x}$	`\frac{\partial f}{\partial x}`
`\ddif{f}{x}`	$\dfrac{\mathrm{d}f}{\mathrm{d}x}$	`\dfrac{\mathrm{d} f}{\mathrm{d} x}`
`\dpdif{f}{x}`	$\dfrac{\partial f}{\partial x}$	`\dfrac{\partial f}{\partial x}`

1.11 Complex Analysis

Input	Output	LaTeX equivalent
`\i`	i	`\mathrm{i}`
`\Re z`	$\operatorname{Re} z$	`\operatorname{Re} z`
`\Im z`	$\operatorname{Im} z$	`\operatorname{Im} z`
`\Arg z`	$\operatorname{Arg} z$	`\operatorname{Arg} z`
`\Log z`	$\operatorname{Log} z$	`\operatorname{Log} z`
`\Sin z`	$\operatorname{Sin} z$	`\operatorname{Sin} z`
`\Cos z`	$\operatorname{Cos} z$	`\operatorname{Cos} z`
`\Tan z`	$\operatorname{Tan} z$	`\operatorname{Tan} z`
`\Res_{z=0} f(z)`	$\operatorname*{Res}_{z=0} f(z)$	`\operatorname*{Res}_{z=0} f(z)`

1.12   Optimization

Input	Output	LaTeX equivalent
`\argmin_{x \in S} f(x)`	$\arg\min_{x \in S} f(x)$	`\operatorname*{arg~min}` `_{x \in S} f(x)`
`\argmax_{x \in S} f(x)`	$\arg\max_{x \in S} f(x)$	`\operatorname*{arg~max}` `_{x \in S} f(x)`
`\Order(n)`	$\mathrm{O}(n)$	`\mathrm{O}(n)`
`\order(n)`	$\mathrm{o}(n)$	`\mathrm{o}(n)`

2   The **okithm** Package

2.1   Theorems

If the language is set to Japanese like by `\usepackage[main = japanese]{babel}`, okithm will translate all the environment titles (Theorem, Definition, etc.) into Japanese. You can disable theorems by giving the option `notheorem` to okicmd.

```
1  \begin{theorem}[Awesome theorem]
2    The square root $\sqrt{2}$ of two is irrational.
3  \end{theorem}
4
5  \begin{definition}[Coprime]
6    Integers $a$ and $b$ are said to be \emph{coprime} if their greatest common
     divisor is one.
7  \end{definition}
8
9  \begin{lemma}
10   If $a$ and $b$ are coprime, so are $a^2$ and $b^2$.
11 \end{lemma}
12
13 \begin{proposition}
14   If $\sqrt{2} = a/b$, then $a^2 = 2b^2$.
15 \end{proposition}
16
17 \begin{corollary}
18   If $\sqrt{2} = a/b$ with $a$ and $b$ being coprime, then $a$ is even.
19 \end{corollary}
20
21 \begin{example}
22   If $a = 2$ and $b = 1$, then $a$ is even but $\sqrt{2} \ne a/b$.
23 \end{example}
24
25 \begin{remark}
26   Note that $a$ and $b$ must be integers.
27 \end{remark}
28
29 \begin{proof}[of Awesome theorem]
30   Suppose to the contrary that $\sqrt{2} = a/b$ with coprime $a$ and $b$.
31   Then both $a$ and $b$ are even, which contradicts the assumption.
32 \end{proof}
```

Theorem 2.1 (Awesome theorem)**.** *The square root $\sqrt{2}$ of two is irrational.*

Definition 2.2 (Coprime)**.** Integers a and b are said to be *coprime* if their greatest common divisor is one.

Lemma 2.3. *If a and b are coprime, so are a^2 and b^2.*

Proposition 2.4. *If $\sqrt{2} = a/b$, then $a^2 = 2b^2$.*

Corollary 2.5. *If $\sqrt{2} = a/b$ with a and b being coprime, then a is even.*

Example 2.6. If $a = 2$ and $b = 1$, then a is even but $\sqrt{2} \neq a/b$. $\qquad\square$

Remark 2.7. Note that a and b must be integers.

Proof (of Awesome theorem). Suppose to the contrary that $\sqrt{2} = a/b$ with coprime a and b. Then both a and b are even, which contradicts the assumption. $\qquad\square$

2.2 Algorithms

You can disable algorithms by setting the option `noalgorithm`.

```
1 \begin{algorithmic}[1]
2   \Input{$n \in \setN$}
3   \Output{$n(n+1)/2$}
4   \State{$s \gets 0$}
5   \ForTo{$i = 1$}{$n$}
6   \State{$s \gets s + i$}
7   \EndFor
8   \State{\Return $s$}
9 \end{algorithmic}
```

Input : $n \in \mathbb{N}$
Output: $n(n+1)/2$
1: $s \gets 0$
2: **for** $i = 1$ **to** n **do**
3:     $s \gets s + i$
4: **return** s

2.3 Optimization Problems

You can change `minimize`, `maximize` and `subject to` into `min`, `max` and `s.t.`, respectively, by setting the option `optstyle` = short.