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

<table>
<tr><th>Input</th><th>Output</th><th>LaTeX (almost) equivalent</th></tr>
<tr><td><code>\prn{\cdot}</code></td><td>$\left(\cdot\right)$</td><td><code>\left(\cdot\right)</code></td></tr>
<tr><td><code>\prn[\big]{\cdot}</code></td><td>$\bigl(\cdot\bigr)$</td><td><code>\bigl(\cdot\bigr)</code></td></tr>
<tr><td><code>\prn[\Big]{\cdot}</code></td><td>$\Bigl(\cdot\Bigr)$</td><td><code>\Bigl(\cdot\Bigr)</code></td></tr>
<tr><td><code>\prn[\bigg]{\cdot}</code></td><td>$\biggl(\cdot\biggr)$</td><td><code>\biggl(\cdot\biggr)</code></td></tr>
<tr><td><code>\prn[\Bigg]{\cdot}</code></td><td>$\Biggl(\cdot\Biggr)$</td><td><code>\Biggl(\cdot\Biggr)</code></td></tr>
<tr><td><code>\curl{\cdot}</code></td><td>$\left\{\cdot\right\}$</td><td><code>\left\{\cdot\right\}</code></td></tr>
<tr><td><code>\sqbr{\cdot}</code></td><td>$\left[\cdot\right]$</td><td><code>\left[\cdot\right]</code></td></tr>
<tr><td><code>\agbr{\cdot}</code></td><td>$\left\langle\cdot\right\rangle$</td><td><code>\left\langle\cdot\right\rangle</code></td></tr>
<tr><td><code>\dbbr{\cdot}</code></td><td>$\left\llbracket\cdot\right\rrbracket$</td><td><code>\left\llbracket\cdot\right\rrbracket</code></td></tr>
<tr><td><code>\pipe{\cdot}</code></td><td>$\left\vert\cdot\right\vert$</td><td><code>\left|\cdot\right|</code></td></tr>
<tr><td><code>\dbpp{\cdot}</code></td><td>$\left\Vert\cdot\right\Vert$</td><td><code>\left\|\cdot\right\|</code></td></tr>
<tr><td><code>\floor{\cdot}</code></td><td>$\left\lfloor\cdot\right\rfloor$</td><td><code>\left\lfloor\cdot\right\rfloor</code></td></tr>
<tr><td><code>\ceil{\cdot}</code></td><td>$\left\lceil\cdot\right\rceil$</td><td><code>\left\lceil\cdot\right\rceil</code></td></tr>
</table>

1.3 Logic

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

1.4 Sets

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

1.5 Maps

<table>
<tr><th>Input</th><th>Output</th><th>LaTeX (almost) equivalent</th></tr>
<tr><td>\doms{X}{Y}</td><td>$X \to Y$</td><td>{X}\to{Y}</td></tr>
<tr><td>\funcdoms{f}{X}{Y}</td><td>$f \colon X \to Y$</td><td>{f}\vcentcolon{X}\to{Y}</td></tr>
<tr><td>\restr{f}{S}</td><td>$\left.f\right|_{S}$</td><td>\left.f\right|_{S}</td></tr>
<tr><td>\id_K</td><td>id_K</td><td>\operatorname{id}_K</td></tr>
<tr><td>\dom f</td><td>$\operatorname{dom} f$</td><td>\operatorname{dom} f</td></tr>
<tr><td>\cod f</td><td>$\operatorname{cod} f$</td><td>\operatorname{cod} f</td></tr>
<tr><td>\supp f</td><td>$\operatorname{supp} f$</td><td>\operatorname{supp} f</td></tr>
</table>

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)`	$\operatorname{Hom}(G)$	`\operatorname{Hom}(G)`
`\End R`	$\operatorname{End} R$	`\operatorname{End} R`
`\Aut_k K`	$\operatorname{Aut}_k K$	`\operatorname{Aut}_k K`
`\gen{a,b}`	$\langle a, b\rangle$	`\left\langlea,b\right\rangle`
`\gen{a,b}[ab = e]`	$\langle a, b \mid ab = e\rangle$	`\left\langlea,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`	$\operatorname{ord} G$	`\operatorname{ord} G`
`\sym_n`	$\mathfrak{S}_n$	`\mathfrak{S}_n`
`\sgn(\sigma)`	$\operatorname{sgn}(\sigma)$	`\operatorname{sgn}(\sigma)`
`\mult{R}`	$R^{\times}$	`R^{\times}`
`\M_{m,n}(R)`	$\operatorname{M}_{m,n}(R)$	`\operatorname{M}_{m,n}(R)`
`\GL_n(R)`	$\operatorname{GL}_n(R)$	`\operatorname{GL}_n(R)`
`\SL_n(R)`	$\operatorname{SL}_n(R)$	`\operatorname{SL}_n(R)`
`\O(n)`	$\operatorname{O}(n)$	`\operatorname{O}(n)`
`\SO(n)`	$\operatorname{SO}(n)$	`\operatorname{SO}(n)`
`\U(n)`	$\operatorname{U}(n)$	`\operatorname{U}(n)`
`\SU(n)`	$\operatorname{SU}(n)$	`\operatorname{SU}(n)`
`\GL(q)`	$\operatorname{GL}(q)$	`\operatorname{GL}(q)`
`L \extends K`	$L \mathbin{/} K$	`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`	$\operatorname{t-rank} A$	`\operatorname{t-rank} A`
`\Pf A`	$\operatorname{Pf} A$	`\operatorname{Pf} A`
`\diag(a_1,\dotsc,a_n)`	$\operatorname{diag}(a_1,\dotsc,a_n)$	`\operatorname{diag} (a_1,\dotsc,a_n)`
`\blockdiag(A_1,\dotsc,A_n)`	$\operatorname{block-diag}(A_1,\dotsc,A_n)$	`\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}`	$\left\langle x,y \right\rangle$	`\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)`	$\operatorname*{arg\,min}_{x \in S} f(x)$	`\operatorname*{arg~min}_{x \in S} f(x)`
`\argmax_{x \in S} f(x)`	$\operatorname*{arg\,max}_{x \in S} f(x)$	`\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.

```latex
\begin{theorem}[Awesome theorem]
  The square root $\sqrt{2}$ of two is irrational.
\end{theorem}

\begin{definition}[Coprime]
  Integers $a$ and $b$ are said to be \emph{coprime} if their greatest common divisor is one.
\end{definition}

\begin{lemma}
  If $a$ and $b$ are coprime, so are $a^2$ and $b^2$.
\end{lemma}

\begin{proposition}
  If $\sqrt{2} = a/b$, then $a^2 = 2b^2$.
\end{proposition}

\begin{corollary}
  If $\sqrt{2} = a/b$ with $a$ and $b$ being coprime, then $a$ is even.
\end{corollary}

\begin{example}
  If $a = 2$ and $b = 1$, then $a$ is even but $\sqrt{2} \ne a/b$.
\end{example}

\begin{remark}
  Note that $a$ and $b$ must be integers.
\end{remark}

\begin{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.
\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 $\sqrt{2} \neq a/b$. □

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. □

2.2 Algorithms

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

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

Input : $n \in \mathbb{N}$
Output: $n(n+1)/2$

$s \leftarrow 0$
for $i = 1$ **to** n **do**
    $s \leftarrow s + i$
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`.