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}`	$\left(\cdot\right)$	`\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}`	$\left\{\cdot\right\}$	`\left\{\cdot\right\}`
`\sqbr{\cdot}`	$\left[\cdot\right]$	`\left[\cdot\right]`
`\agbr{\cdot}`	$\left\langle\cdot\right\rangle$	`\left\langle\cdot\right\rangle`
`\dbbr{\cdot}`	$\left\llbracket\cdot\right\rrbracket$	`\left\llbracket\cdot\right\rrbracket`
`\pipe{\cdot}`	$\left\lvert\cdot\right\rvert$	`\left|\cdot\right|`
`\dbpp{\cdot}`	$\left\lVert\cdot\right\rVert$	`\left|\cdot\right|`
`\floor{\cdot}`	$\left\lfloor\cdot\right\rfloor$	`\left\lfloor\cdot\right\rfloor`
`\ceil{\cdot}`	$\left\lceil\cdot\right\rceil$	`\left\lceil\cdot\right\rceil`

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><code>\set{a \in S}</code></td><td>$\{a \in S\}$</td><td><code>\left\{a \in S\right\}</code></td></tr>
<tr><td><code>\set{a \in S}[a^2 = 1]</code></td><td>$\{a \in S \mid a^2 = 1\}$</td><td><code>\left\{a \in S\mathrel{}\middle|</code>
<code>\mathrel{}a^2 = 1\right\}</code></td></tr>
<tr><td><code>\card{X}</code></td><td>$|X|$</td><td><code>\left|X\right|</code></td></tr>
<tr><td><code>X \symdif Y</code></td><td>$X \mathbin{\triangle} Y$</td><td><code>X \mathbin{\triangle} Y</code></td></tr>
<tr><td><code>\setN</code></td><td>$\mathbb{N}$</td><td><code>\mathbb{N}</code></td></tr>
<tr><td><code>\setZ</code></td><td>$\mathbb{Z}$</td><td><code>\mathbb{Z}</code></td></tr>
<tr><td><code>\setQ</code></td><td>$\mathbb{Q}$</td><td><code>\mathbb{Q}</code></td></tr>
<tr><td><code>\setR</code></td><td>$\mathbb{R}$</td><td><code>\mathbb{R}</code></td></tr>
<tr><td><code>\setC</code></td><td>$\mathbb{C}$</td><td><code>\mathbb{C}</code></td></tr>
<tr><td><code>\setH</code></td><td>$\mathbb{H}$</td><td><code>\mathbb{H}</code></td></tr>
<tr><td><code>\setF</code></td><td>$\mathbb{F}$</td><td><code>\mathbb{F}</code></td></tr>
<tr><td><code>\setK</code></td><td>$\mathbb{K}$</td><td><code>\mathbb{K}</code></td></tr>
<tr><td><code>\setZp</code></td><td>$\mathbb{Z}_{\ge 0}$</td><td><code>\mathbb{Z}_{\ge0}</code></td></tr>
<tr><td><code>\setQp</code></td><td>$\mathbb{Q}_{\ge 0}$</td><td><code>\mathbb{Q}_{\ge0}</code></td></tr>
<tr><td><code>\setRp</code></td><td>$\mathbb{R}_{\ge 0}$</td><td><code>\mathbb{R}_{\ge0}</code></td></tr>
<tr><td><code>\setNpp</code></td><td>$\mathbb{N}_{>0}$</td><td><code>\mathbb{N}_{>0}</code></td></tr>
<tr><td><code>\setZpp</code></td><td>$\mathbb{Z}_{>0}$</td><td><code>\mathbb{Z}_{>0}</code></td></tr>
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<tr><td><code>\setRpp</code></td><td>$\mathbb{R}_{>0}$</td><td><code>\mathbb{R}_{>0}</code></td></tr>
</table>

1.5 Maps

<table>
<tr><th>Input</th><th>Output</th><th>LaTeX equivalent</th></tr>
<tr><td><code>\doms{X}{Y}</code></td><td>$X \to Y$</td><td><code>{X}\to{Y}</code></td></tr>
<tr><td><code>\funcdoms{f}{X}{Y}</code></td><td>$f : X \to Y$</td><td><code>{f}\vcentcolon{X}\to{Y}</code></td></tr>
<tr><td><code>\restr{f}{S}</code></td><td>$f|_S$</td><td><code>\left.f\right|_{S}</code></td></tr>
<tr><td><code>\id_K</code></td><td>id_K</td><td><code>\operatorname{id}_K</code></td></tr>
<tr><td><code>\dom f</code></td><td>$\operatorname{dom} f$</td><td><code>\operatorname{dom} f</code></td></tr>
<tr><td><code>\cod f</code></td><td>$\operatorname{cod} f$</td><td><code>\operatorname{cod} f</code></td></tr>
<tr><td><code>\supp f</code></td><td>$\operatorname{supp} f$</td><td><code>\operatorname{supp} f</code></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 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 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
`\tr A`	$\operatorname{tr} A$
`\rank A`	$\operatorname{rank} A$
`\trank A`	$\operatorname{t-rank} A$
`\Pf A`	$\operatorname{Pf} A$
`\diag(a_1, \ldots, a_n)`	$\operatorname{diag}(a_1, \ldots, a_n)$
`\blockdiag(A_1, \ldots, A_n)`	$\operatorname{block-diag}(A_1, \ldots, A_n)$
`\vectorize(A)`	$\operatorname{vec}(A)$
`\Row(A)`	$\operatorname{Row}(A)$
`\Col(A)`	$\operatorname{Col}(A)$
`\onevec`	$\mathbb{1}$
`\trsp{A}`	$A^\top$
`\adjo{A}`	A^*
`\inpr{x}{y}`	$\langle x, y \rangle$

1.10 Analysis

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

1.11 Complex Analysis

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

1.12 Optimization

Input	Output
`\argmin_{x \in S} f(x)`	$\operatorname{arg\,min}_{x \in S} f(x)$
`\argmax_{x \in S} f(x)`	$\operatorname{arg\,max}_{x \in S} f(x)$
`\Order(n)`	$\mathrm{O}(n)$
`\order(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.

```
\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`.