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

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1 The **okicmd** Package

1.1 Alphabets

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

1.2 Parentheses

Input	Output
`\prn{\cdot}`	$(\cdot)$
`\prn[\big]{\cdot}`	$\big(\cdot\big)$
`\prn[\Big]{\cdot}`	$\Big(\cdot\Big)$
`\prn[\bigg]{\cdot}`	$\bigg(\cdot\bigg)$
`\prn[\Bigg]{\cdot}`	$\Bigg(\cdot\Bigg)$
`\curl{\cdot}`	$\{\cdot\}$
`\sqbr{\cdot}`	$[\cdot]$
`\agbr{\cdot}`	$\langle\cdot\rangle$
`\dbbr{\cdot}`	$[\![\cdot]\!]$
`\abs{\cdot}`	$\lvert\cdot\rvert$
`\norm{\cdot}`	$\lVert\cdot\rVert$
`\floor{\cdot}`	$\lfloor\cdot\rfloor$
`\ceil{\cdot}`	$\lceil\cdot\rceil$

1.3 Logic

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

1.4 Sets

Input	Output
`\set{a \in S}`	$\{a \in S\}$
`\set{a \in S}[a^2 = 1]`	$\{a \in S \mid a^2 = 1\}$
`\intset{n}`	$[n]$
`\card{X}`	$\lvert X \rvert$
`X \symdif Y`	$X \mathbin{\triangle} Y$
`\setN`	$\mathbb{N}$
`\setZ`	$\mathbb{Z}$
`\setQ`	$\mathbb{Q}$
`\setR`	$\mathbb{R}$
`\setC`	$\mathbb{C}$
`\setH`	$\mathbb{H}$
`\setF`	$\mathbb{F}$
`\setK`	$\mathbb{K}$
`\setZp`	$\mathbb{Z}_{\geq 0}$
`\setQp`	$\mathbb{Q}_{\geq 0}$
`\setRp`	$\mathbb{R}_{\geq 0}$

1.5 Maps

Input	Output
`\doms{X}{Y}`	$X \to Y$
`\funcdoms{f}{X}{Y}`	$f \colon X \to Y$
`\restr{f}{S}`	$f\vert_S$
`\id_K`	id_K
`\dom f`	$\operatorname{dom} f$
`\cod f`	$\operatorname{cod} f$
`\supp f`	$\operatorname{supp} f$

1.6 Lattices

Input	Output
`x \meet y`	$x \wedge y$
`x \join y`	$x \vee y$
`\bigmeet`	$\bigwedge$
`\bigjoin`	$\bigvee$

1.7 Algebra

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

1.8 Number Theory

Input	Output
`a \coprime b`	$a \perp b$
`a \divides b`	$a \mid b$
`a \ndivides b`	$a \nmid b$

1.9 Linear Algebra

Input	Output
`\tr A`	$\operatorname{tr} A$
`\rank A`	$\operatorname{rank} A$
`\trank A`	$\operatorname{t-rank} A$
`\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
`\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}

```

```latex
\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 $\sqrt{2} \neq a/b$. $\square$

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. $\square$

2.2 Algorithms

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

```latex
\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`.

```
\Minimize[name={(P)}]{
  \sum_{\condit{x \in S}[x^2 = 1]} w (x) + \sum_{i=1}^n (p_i + q_i)
}{
  S \subseteq V, \\
  p_i \ge 0 & (i = 1, \ldots, n), \\
  q_i \ge 0 & (i = 1, \ldots, n)
}
```

$$\text{(P)} \quad \left| \begin{array}{ll} \text{minimize} & \displaystyle\sum_{x \in S : x^2 = 1} w(x) + \sum_{i=1}^{n} (p_i + q_i) \\ \text{subject to} & S \subseteq V, \\ & p_i \geq 0 \quad (i = 1, \ldots, n), \\ & q_i \geq 0 \quad (i = 1, \ldots, n) \end{array} \right.$$