

# Documentation: *khermisc.sty*

Klaus Herrmann

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## Symbols defined in *khermisc*

The defined symbols are grouped by different areas of mathematics (as far as such a grouping is possible) and can be made available by enabling the options of the package. This allows to only import the definitions and commands that are needed for a specific project. The overloaded syntax is made possible by using `\NewDocumentCommand` of the *xparse* package, and as such optional parameters for the commands are in square brackets and come before the mandatory parameters in curly brackets. For example, in case of the indicator function it is mandatory to supply a set as an argument, while an evaluation point is optional. The usage is therefore `\ind{A}` for the function  $\mathbb{1}_A$ , while `\ind[x]{A}` adds the evaluation point  $\mathbb{1}_A(x)$ .

## General symbols - available by default

Symbol	Name	Definition
$a := b$	left hand side definition: $a$ is defined by $b$	<code>a \ldef b</code>
$a =: b$	right hand side definition: $b$ is defined by $a$	<code>a \rdef b</code>

## Symbols in option *sets*

Symbol	Name	Definition
$\mathbb{N}$	natural numbers	<code>\N</code>
$\mathbb{Z}$	integers	<code>\Z</code>
$\mathbb{Q}$	rational numbers	<code>\Q</code>
$\mathbb{R}$	real numbers	<code>\R</code>
$\overline{\mathbb{R}}$	extended real numbers	<code>\Rbar</code>
$\mathbb{C}$	complex numbers	<code>\C</code>
$\mathcal{P}(E)$	power set of $E$	<code>\PowerSet(E)</code>

## Symbols in option *real*

Symbol	Name	Definition
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$e$	Euler's number	<code>\e</code>
$\operatorname{argmin}$	arg min	<code>\argmin</code>
$\operatorname{argmax}$	arg max	<code>\argmax</code>
$ x $	absolute value of $x$	<code>\abs{x}</code>
$d$	straight differential for integrals and derivatives	<code>\d</code>
$\ x\ $	norm of $x$	<code>\norm{x}</code>
$\ x\ _{L^2}$	norm of $x$ with subscript	<code>\norm[L^2]{x}</code>
$\operatorname{vol}$	volume operator	<code>\vol</code>
$\operatorname{vol}(A)$	volume of $A$	<code>\vol[A]</code>
$\mathbf{1}_A$	indicator function of set $A$	<code>\ind{A}</code>
$\mathbf{1}_A(x)$	indicator function of $A$ evaluated at $x \in \mathbb{R}$	<code>\ind[x]{A}</code>
$\lfloor x \rfloor$	largest integer smaller than $x$	<code>\floor{x}</code>
$\lceil x \rceil$	smallest integer larger than $x$	<code>\ceil{x}</code>
$\operatorname{sinc}$	sinc function $\operatorname{sinc}(x) = \sin(x)/x$	<code>\sinc</code>
$o$	small o	<code>\landau</code>
$\mathcal{O}$	big O	<code>\Landau</code>

### Symbols in option *complex*

Symbol	Name	Definition
$i$	imaginary unit	<code>\iu</code>
$\operatorname{Re}$	real part of imaginary number	<code>\re</code>
$\operatorname{Re}(z)$	real part of imaginary number $z$	<code>\re[z]</code>
$\operatorname{Im}$	imaginary part of imaginary number	<code>\im</code>
$\operatorname{Im}(z)$	imaginary part of imaginary number $z$	<code>\im[z]</code>

### Symbols in option *measure*

Symbol	Name	Definition
$\mathcal{D}$	Dynkin system	<code>\Dynkin</code>
$\tau$	topology	<code>\Topology</code>
$\mathcal{B}(\mathbb{R})$	Borel sigma algebra	<code>\Borel(\mathbb{R})</code>
$\lambda$	Lebesgue measure	<code>\leb</code>
$f_{\#}\mu$	push forward measure of $\mu$ under $f$	<code>\pfm{\mu}{f}</code>
$d$	metric symbol	<code>\metric</code>
$d_X$	metric on $X$	<code>\metric[] [] [X]</code>
$d_X(x, y)$	metric on $X$ of $x$ and $y$	<code>\metric[x] [y] [X]</code>
$d(x, y)$	metric of $x$ and $y$	<code>\metric[x] [y]</code>

### Symbols in option *prob*

Symbol	Name	Definition
$X \perp\!\!\!\perp Y$	$X$ is independent of $Y$	<code>X \indep Y</code>
$\Omega$	Probability space	<code>\Pspace</code>

$\mathcal{F}$	Sigma algebra based on letter F	<code>\SigAlgF</code>
$X_n \xrightarrow{d} X$	$X_n$ converges to $X$ in distribution	<code>X_n \indist X</code>
$X_n \xrightarrow{a.s.} X$	$X_n$ converges to $X$ almost surely	<code>X_n \as X</code>
$X_n \xrightarrow{p.s.} X$	$X_n$ converges to $X$ presque sûrement	<code>X_n \ps X</code>
$X_n \xrightarrow{L^p} X$	$X_n$ converges to $X$ in $L^p$	<code>X_n \inLp{p} X</code>
$X_n \xrightarrow{\mathbb{P}} X$	$X_n$ converges to $X$ in probability	<code>X_n \inprob X</code>
$X \stackrel{d}{=} Y$	$X$ is equal to $Y$ in distribution	<code>X \eqindist Y</code>
$X \stackrel{a.s.}{=} Y$	$X$ is equal to $Y$ almost surely	<code>X \eqas Y</code>
$X \stackrel{a.s.}{\neq} Y$	$X$ is not equal to $Y$ almost surely	<code>X \neqas Y</code>
$X \stackrel{p.s.}{=} Y$	$X$ is equal to $Y$ presque sûrement	<code>X \eqps Y</code>
$X \stackrel{p.s.}{\neq} Y$	$X$ is not equal to $Y$ presque sûrement	<code>X \neqps Y</code>
$o_{a.s.}$	little o almost surely	<code>\landauAS</code>
$\mathcal{O}_{a.s.}$	big O almost surely	<code>\LandauAS</code>
$o_{\mathbb{P}}$	little o in probability	<code>\landauP</code>
$\mathcal{O}_{\mathbb{P}}$	big O in probability	<code>\LandauP</code>
$\text{cov}$	covariance operator	<code>\cov</code>
$\text{cov}[X, X]$	covariance of $X$	<code>\cov[X]</code>
$\text{cov}[X, Y]$	covariance of $X$ and $Y$	<code>\cov[X][Y]</code>
$\text{corr}$	correlation operator	<code>\corr</code>
$\text{corr}[X, X]$	correlation of $X$	<code>\corr[X]</code>
$\text{corr}[X, Y]$	correlation of $X$ and $Y$	<code>\corr[X][Y]</code>
$\text{var}$	variance operator	<code>\var</code>
$\text{var}[X]$	variance of $X$	<code>\var[X]</code>
$\text{sd}$	standard deviation operator	<code>\sd</code>
$\text{sd}[X]$	standard deviation of $X$	<code>\sd[X]</code>
$\mathbb{P}$	probability measure	<code>\Prob</code>
$\mathbb{P}(A)$	probability measure of event $A$	<code>\Prob[A]</code>
$\mathbb{P}_X$	probability measure of $X$	<code>\Prob[] [X]</code>
$\mathbb{P}_X(A)$	probability measure of $X$ for event $A$	<code>\Prob[A][X]</code>
$\mathbb{E}$	expectation operator	<code>\Exp</code>
$\mathbb{E}[X]$	expectation of $X$	<code>\Exp[X]</code>
$\mathbb{E}_F$	expectation with respect to $F$	<code>\Exp[] [F]</code>
$\mathbb{E}_F[X]$	expectation of $X$ with respect to $F$	<code>\Exp[X][F]</code>
$\text{med}$	median operator	<code>\median</code>
$\text{med}[X]$	median of $X$	<code>\median[X]</code>

## Symbols in option *bold*

Bold symbols for the Latin and Greek alphabet. Bold symbols basically follow the pattern `\b+LETTER`. However, for some symbols this pattern leads to already reserved keywords. For bold  $f$ ,  $m$  and  $\eta$  we therefore have `\bbf`, `\bbm` and `\bfeta`.

Symbol	Name	Definition
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<b><i>A</i></b>	bold A	\bA
<b><i>B</i></b>	bold B	\bB
<b><i>C</i></b>	bold C	\bC
<b><i>D</i></b>	bold D	\bD
<b><i>E</i></b>	bold E	\bE
<b><i>F</i></b>	bold F	\bF
<b><i>G</i></b>	bold G	\bG
<b><i>H</i></b>	bold H	\bH
<b><i>I</i></b>	bold I	\bI
<b><i>J</i></b>	bold J	\bJ
<b><i>K</i></b>	bold K	\bK
<b><i>L</i></b>	bold L	\bL
<b><i>M</i></b>	bold M	\bM
<b><i>N</i></b>	bold N	\bN
<b><i>O</i></b>	bold O	\bO
<b><i>P</i></b>	bold P	\bP
<b><i>Q</i></b>	bold Q	\bQ
<b><i>R</i></b>	bold R	\bR
<b><i>S</i></b>	bold S	\bS
<b><i>T</i></b>	bold T	\bT
<b><i>U</i></b>	bold U	\bU
<b><i>V</i></b>	bold V	\bV
<b><i>W</i></b>	bold W	\bW
<b><i>X</i></b>	bold X	\bX
<b><i>Y</i></b>	bold Y	\bY
<b><i>Z</i></b>	bold Z	\bZ
<b><i>a</i></b>	bold a	\ba
<b><i>b</i></b>	bold b	\bb
<b><i>c</i></b>	bold c	\bc
<b><i>d</i></b>	bold d	\bd
<b><i>e</i></b>	bold e	\be
<b><i>f</i></b>	bold f	\bbf
<b><i>g</i></b>	bold g	\bg
<b><i>h</i></b>	bold h	\bh
<b><i>i</i></b>	bold i	\bi
<b><i>j</i></b>	bold j	\bj
<b><i>k</i></b>	bold k	\bk
<b><i>l</i></b>	bold l	\bl
<b><i>m</i></b>	bold m	\bbm
<b><i>n</i></b>	bold n	\bn
<b><i>o</i></b>	bold o	\bo
<b><i>p</i></b>	bold p	\bp
<b><i>q</i></b>	bold q	\bq
<b><i>r</i></b>	bold r	\br
<b><i>s</i></b>	bold s	\bs
<b><i>t</i></b>	bold t	\bt

<b><math>u</math></b>	bold u	<code>\bu</code>
<b><math>v</math></b>	bold v	<code>\bv</code>
<b><math>w</math></b>	bold w	<code>\bw</code>
<b><math>x</math></b>	bold x	<code>\bx</code>
<b><math>y</math></b>	bold y	<code>\by</code>
<b><math>z</math></b>	bold z	<code>\bz</code>
<b><math>\alpha</math></b>	bold alpha	<code>\balpha</code>
<b><math>\beta</math></b>	bold beta	<code>\bbeta</code>
<b><math>\gamma</math></b>	bold gamma	<code>\bgamma</code>
<b><math>\Gamma</math></b>	bold Gamma	<code>\bGamma</code>
<b><math>\delta</math></b>	bold delta	<code>\bdelta</code>
<b><math>\Delta</math></b>	bold Delta	<code>\bDelta</code>
<b><math>\epsilon</math></b>	bold epsilon	<code>\bepsilon</code>
<b><math>\varepsilon</math></b>	bold varepsilon	<code>\bvarepsilon</code>
<b><math>\zeta</math></b>	bold zeta	<code>\bzeta</code>
<b><math>\eta</math></b>	bold eta	<code>\beta</code>
<b><math>\theta</math></b>	bold theta	<code>\btheta</code>
<b><math>\vartheta</math></b>	bold vartheta	<code>\bvartheta</code>
<b><math>\Theta</math></b>	bold Theta	<code>\bTheta</code>
<b><math>\iota</math></b>	bold iota	<code>\biota</code>
<b><math>\kappa</math></b>	bold kappa	<code>\bkappa</code>
<b><math>\lambda</math></b>	bold lambda	<code>\blambda</code>
<b><math>\Lambda</math></b>	bold Lambda	<code>\bLambda</code>
<b><math>\mu</math></b>	bold mu	<code>\bm\mu</code>
<b><math>\nu</math></b>	bold nu	<code>\bnu</code>
<b><math>\xi</math></b>	bold xi	<code>\bxi</code>
<b><math>\Xi</math></b>	bold Xi	<code>\bXi</code>
<b><math>\pi</math></b>	bold pi	<code>\bpi</code>
<b><math>\Pi</math></b>	bold pi	<code>\bPi</code>
<b><math>\rho</math></b>	bold rho	<code>\brho</code>
<b><math>\varrho</math></b>	bold varrho	<code>\bvarrho</code>
<b><math>\sigma</math></b>	bold sigma	<code>\bsigma</code>
<b><math>\Sigma</math></b>	bold Sigma	<code>\bSigma</code>
<b><math>\tau</math></b>	bold tau	<code>\btau</code>
<b><math>\upsilon</math></b>	bold upsilon	<code>\bupsilon</code>
<b><math>\Upsilon</math></b>	bold Upsilon	<code>\bUpsilon</code>
<b><math>\phi</math></b>	bold phi	<code>\bphi</code>
<b><math>\varphi</math></b>	bold varphi	<code>\bvarphi</code>
<b><math>\Phi</math></b>	bold Phi	<code>\bPhi</code>
<b><math>\chi</math></b>	bold chi	<code>\bchi</code>
<b><math>\psi</math></b>	bold psi	<code>\bpsi</code>
<b><math>\Psi</math></b>	bold Psi	<code>\bPsi</code>
<b><math>\omega</math></b>	bold omega	<code>\bomega</code>
<b><math>\Omega</math></b>	bold Omega	<code>\bOmega</code>

## Symbols in option *cal*

Calligraphic letter for the Latin alphabet. Calligraphic symbols follow the pattern `\cal+LETTER`.

Symbol	Name	Definition
<i>A</i>	calligraphy A	<code>\calA</code>
<i>B</i>	calligraphy B	<code>\calB</code>
<i>C</i>	calligraphy C	<code>\calC</code>
<i>D</i>	calligraphy D	<code>\calD</code>
<i>E</i>	calligraphy E	<code>\calE</code>
<i>F</i>	calligraphy F	<code>\calF</code>
<i>G</i>	calligraphy G	<code>\calG</code>
<i>H</i>	calligraphy H	<code>\calH</code>
<i>I</i>	calligraphy I	<code>\calI</code>
<i>J</i>	calligraphy J	<code>\calJ</code>
<i>K</i>	calligraphy K	<code>\calK</code>
<i>L</i>	calligraphy L	<code>\calL</code>
<i>M</i>	calligraphy M	<code>\calM</code>
<i>N</i>	calligraphy N	<code>\calN</code>
<i>O</i>	calligraphy O	<code>\calO</code>
<i>P</i>	calligraphy P	<code>\calP</code>
<i>Q</i>	calligraphy Q	<code>\calQ</code>
<i>R</i>	calligraphy R	<code>\calR</code>
<i>S</i>	calligraphy S	<code>\calS</code>
<i>T</i>	calligraphy T	<code>\calT</code>
<i>U</i>	calligraphy U	<code>\calU</code>
<i>V</i>	calligraphy V	<code>\calV</code>
<i>W</i>	calligraphy W	<code>\calW</code>
<i>X</i>	calligraphy X	<code>\calX</code>
<i>Y</i>	calligraphy Y	<code>\calY</code>
<i>Z</i>	calligraphy Z	<code>\calZ</code>
<i>a</i>	calligraphy a	<code>\cala</code>
<i>b</i>	calligraphy b	<code>\calb</code>
<i>c</i>	calligraphy c	<code>\calc</code>
<i>d</i>	calligraphy d	<code>\cald</code>
<i>e</i>	calligraphy e	<code>\cale</code>
<i>f</i>	calligraphy f	<code>\calf</code>
<i>g</i>	calligraphy g	<code>\calg</code>
<i>h</i>	calligraphy h	<code>\calh</code>
<i>i</i>	calligraphy i	<code>\cali</code>
<i>j</i>	calligraphy j	<code>\calj</code>
<i>k</i>	calligraphy k	<code>\calk</code>
<i>l</i>	calligraphy l	<code>\call</code>
<i>m</i>	calligraphy m	<code>\calm</code>
<i>n</i>	calligraphy n	<code>\caln</code>
<i>o</i>	calligraphy o	<code>\calo</code>

$p$	calligraphy p	<code>\calp</code>
$q$	calligraphy q	<code>\calq</code>
$r$	calligraphy r	<code>\calr</code>
$s$	calligraphy s	<code>\cals</code>
$t$	calligraphy t	<code>\calt</code>
$u$	calligraphy u	<code>\calu</code>
$v$	calligraphy v	<code>\calv</code>
$w$	calligraphy w	<code>\calw</code>
$x$	calligraphy x	<code>\calx</code>
$y$	calligraphy y	<code>\caly</code>
$z$	calligraphy z	<code>\calz</code>

## Symbols in option *laws*

Symbols for probability laws follow a **R** type syntax `\1+NAME`.

Symbol	Name	Definition
Unif	law of the uniform distribution	<code>\lunif</code>
$\mathcal{N}$	law of the normal distribution	<code>\lnorm</code>
Pois	law of the Poisson distribution	<code>\lpois</code>
Binom	law of the binomial distribution	<code>\lbin</code>
Exp	law of the exponential distribution	<code>\lexp</code>
Ber	law of the Bernoulli distribution	<code>\lber</code>
t	law of the student t distribution	<code>\lt</code>