

Math-Symbols-in-L^AT_EX-Manual

polossk

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1 Constants and Useful Symbols

- `\mi`: alias of `\mathrm i`, i
- `\me`: alias of `\mathrm e`, e
- `\mnatr`: alias of `\mathbb N`, \mathbb{N}
- `\mintg`: alias of `\mathbb Z`, \mathbb{Z}
- `\mrato`: alias of `\mathbb Q`, \mathbb{Q}
- `\mreal`: alias of `\mathbb R`, \mathbb{R}
- `\mcmpx`: alias of `\mathbb C`, \mathbb{C}
- `\mhilb`: alias of `\mathbb H`, \mathbb{H}
- `\mcond`: alias of `\mathrm {Cond.}`, Cond.
- `\mconst`: alias of `\mathrm {const}`, const
- `\mscon{}`: continuous function space. eg: `\mscon{(I)}` gets $C(I)$
- `\mscab`: continuous function space, alias of `\mscon{[a, b]}`, $C[a, b]$
- `\mslbg[]{}{}`: lebesgue function space. eg: `\mslbg{2}` gets $L^2(I)$, `\mslbg{[a, b]}{2}` gets $L^2([a, b])$
- `\mssbl[]{}{}`: sobolev function space. eg: `\mssbl{m}` gets $H^m(I)$, `\mssbl{[a, b]}{m}` gets $H^m([a, b])$

2 Vector and Matrix Definition

- `\mv*`: Vector Notations, alias of `\bm *`, `*` could be any English characters or Greek characters. For examples, `\mva` gets \mathbf{a} , and `\mvalpha` gets $\boldsymbol{\alpha}$. The alphabet looks like this: $\mathbf{a}, \mathbf{b}, \mathbf{c}, \mathbf{d}, \mathbf{e}, \mathbf{f}, \mathbf{g}, \mathbf{h}, \mathbf{i}, \mathbf{j}, \mathbf{k}, \mathbf{l}, \mathbf{m}, \mathbf{n}, \mathbf{o}, \mathbf{p}, \mathbf{q}, \mathbf{r}, \mathbf{s}, \mathbf{t}, \mathbf{u}, \mathbf{v}, \mathbf{w}, \mathbf{x}, \mathbf{y}, \mathbf{z}, \boldsymbol{\alpha}, \boldsymbol{\beta}, \boldsymbol{\gamma}, \boldsymbol{\delta}, \boldsymbol{\epsilon}, \boldsymbol{\zeta}, \boldsymbol{\eta}, \boldsymbol{\theta}, \boldsymbol{\iota}, \boldsymbol{\kappa}, \boldsymbol{\lambda}, \boldsymbol{\mu}, \boldsymbol{\nu}, \boldsymbol{\xi}, \boldsymbol{\pi}, \boldsymbol{\rho}, \boldsymbol{\sigma}, \boldsymbol{\tau}, \boldsymbol{\upsilon}, \boldsymbol{\phi}, \boldsymbol{\chi}, \boldsymbol{\psi}, \boldsymbol{\omega}$
- `\mm*`: Matrix Notations, alias of `\mathbfbf *`, `*` could be any English characters or Greek characters. For examples, `\mma` gets \mathbf{A} , and `\mmsigma` gets $\boldsymbol{\Sigma}$. The alphabet looks like this: $\mathbf{A}, \mathbf{B}, \mathbf{C}, \mathbf{D}, \mathbf{E}, \mathbf{F}, \mathbf{G}, \mathbf{H}, \mathbf{I}, \mathbf{J}, \mathbf{K}, \mathbf{L}, \mathbf{M}, \mathbf{N}, \mathbf{O}, \mathbf{P}, \mathbf{Q}, \mathbf{R}, \mathbf{S}, \mathbf{T}, \mathbf{U}, \mathbf{V}, \mathbf{W}, \mathbf{X}, \mathbf{Y}, \mathbf{Z}, \boldsymbol{\Gamma}, \boldsymbol{\Delta}, \boldsymbol{\Theta}, \boldsymbol{\Lambda}, \boldsymbol{\Xi}, \boldsymbol{\Pi}, \boldsymbol{\Sigma}, \boldsymbol{\Upsilon}, \boldsymbol{\Phi}, \boldsymbol{\Psi}, \boldsymbol{\Omega}$
- `\mm*t`: Transposed Matrix Notations, alias of `\{\mathbfbf *\}^T`, `*` could be any English characters or Greek characters. For examples, `\mma` gets \mathbf{A} , and `\mmsigma` gets $\boldsymbol{\Sigma}$. The alphabet looks like this: $\mathbf{A}^T, \mathbf{B}^T, \mathbf{C}^T, \mathbf{D}^T, \mathbf{E}^T, \mathbf{F}^T, \mathbf{G}^T, \mathbf{H}^T, \mathbf{I}^T, \mathbf{J}^T, \mathbf{K}^T, \mathbf{L}^T, \mathbf{M}^T, \mathbf{N}^T, \mathbf{O}^T, \mathbf{P}^T, \mathbf{Q}^T, \mathbf{R}^T, \mathbf{S}^T, \mathbf{T}^T, \mathbf{U}^T, \mathbf{V}^T, \mathbf{W}^T, \mathbf{X}^T, \mathbf{Y}^T, \mathbf{Z}^T, \boldsymbol{\Gamma}^T, \boldsymbol{\Delta}^T, \boldsymbol{\Theta}^T, \boldsymbol{\Lambda}^T, \boldsymbol{\Xi}^T, \boldsymbol{\Pi}^T, \boldsymbol{\Sigma}^T, \boldsymbol{\Upsilon}^T, \boldsymbol{\Phi}^T, \boldsymbol{\Psi}^T, \boldsymbol{\Omega}^T$
- `\mvzero`, `\mvone`, `\mmzero`, `\mmone`: Special vector and matrix notation, $\mathbf{0}, \mathbf{1}, \mathbf{0}, \mathbf{1}$

3 Useful Functions and Operators

- `\diff`: diff operator, d , eg. $\int_0^t f(\tau) d\tau$
- `\Diff`: Diff operator, D , eg. $D^2 X = \frac{-x_{i+1,j} + 2x_{i,j} - x_{i-1,j}}{\Delta x^2}$
- `\Expect`: Expect operator, E , eg. $X = B(n, p)$, $E X = np$
- `\diag`, `\eig`, `\tr`: Matrix operators, diag, eig, tr, eg. $\mathbf{D} = \text{diag } \mathbf{A}$, $[\boldsymbol{\Lambda}, \mathbf{V}] = \text{eig } \mathbf{A}$, $\text{tr } \boldsymbol{\Lambda} = \text{tr } \mathbf{A}$
- `\lcm`: lcm operator, lcm, eg. $\text{lcm}(f, g) \cdot \text{gcd}(f, g) = f \cdot g$
- `\rand`: random number, rand
- `\mean`, `\var`: statistics operator, mean, var, eg. $\mu = \text{mean } X$, $\sigma^2 = \text{var } X$
- `\corr`: correlation operator, corr, eg. $\text{corr}(X, Y) = (R)_{ij} = \frac{\sum_{X_i, Y_j} (X - \bar{X})(Y - \bar{Y})}{\sqrt{\sum_i (X - \bar{X})^2 \sum_j (Y - \bar{Y})^2}}$
- `\conv`: convolution operator, conv, eg. $\text{conv}(f, g) = \int_{-\infty}^{\infty} f(\tau)g(t - \tau) d\tau$
- `\card`: cardinals operator, card, eg. $\text{card}\{1, 2, 3\} = 3$, $\text{card } \mathbb{R} = 2^{\aleph_0}$
- `\argmin`, `\argmax`, `\argopt`: argmin, argmax, argopt operator, $\hat{\theta} = \underset{\theta}{\text{argmin}} J_{\theta}(x)$
- `\dist`: distance operator, dist, eg. $\min_{\forall s, t \in G} \sum_{s \neq t} \text{dist}(s, t)$
- `\abs{}`, `\norm{}`: norm operator, eg. $|x + y| \leq |x| + |y|$, $\|\mathbf{Ax} + \mathbf{b}\|$
- `\normlp{ }{ }`: Lp-norm operator, eg. $\|1\|_2$, $\|\mathbf{Ax} + \mathbf{b}\|_2$, $\|\mathbf{Ax} + \mathbf{b}\|_{\infty}$

4 Useful Aliases and Generators

- `\fracdiffs{}`: frac & diff operator, also provide `\dfracdiffs{}` mode. For example, `\fracdiffs{x}` gets $\frac{d}{dx}$, `\fracdiffs{y}` gets $\frac{d}{dy}$, `\dfracdiffs{z}` gets $\frac{d}{dz}$
- `\fracdiffd{}`: frac & diff operator, also provide `\dfracdiffd{}` mode. For example, `\fracdiffd{u}{x}` gets $\frac{du}{dx}$, `\dfracdiffd{^2u}{x^2}` gets $\frac{d^2u}{dx^2}$
- `\fracpartials{}`: frac & partial operator, also provide `\dfracpartials{}` mode. For example, `\fracpartials{x}` gets $\frac{\partial}{\partial x}$, `\dfracpartials{y}` gets $\frac{\partial}{\partial y}$
- `\fracpartiald{}`: frac & partial operator, also provide `\dfracpartiald{}` mode. For example, `\fracpartiald{u}{x}` gets $\frac{\partial u}{\partial x}$, `\dfracpartiald{^2u}{x^2}` gets $\frac{\partial^2 u}{\partial x^2}$
- `\mclosure`, `\mclosuresquare`, `\mclosurebrace`: auto height brackets, eg $\left\{ \left[(a^2 + b^2)^2 \right]^2 \right\}$
- `\mvct`, `\mvctz`: row vector creator, eg `\mvct{a}{n}` gets (a_1, a_2, \dots, a_n) , `\mvctz{a}{n}` gets (a_0, a_1, \dots, a_n)
- `\mvctt`, `\mvctzt`: column vector creator, eg `\mvctt{a}{n}` gets $(a_1, a_2, \dots, a_n)^T$, `\mvctzt{a}{n}` gets $(a_0, a_1, \dots, a_n)^T$
- `\mequlist`: provided a list of equations, eg `\mequlist{x + y = 10 \\\4x + 2y = 30}` gets
$$\begin{cases} x + y = 10 \\ 4x + 2y = 30 \end{cases}$$