

Math-Symbols-in-L^AT_EX-Manual

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1 Constants and Useful Symbols

- `\mi`: alias of `\mathrm i`, i
- `\me`: alias of `\mathrm e`, e
- `\mreal`: alias of `\mathbb R`, \mathbb{R}
- `\mhib`: 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 Defination

- `\mv*`: Vector Notations, alias of `\bm *`, `*` could be any English characters or Greek characters. For examples, `\mva` gets a , and `\mvalpha` gets α . The alphabet looks like this: $a, b, c, d, e, f, g, h, i, j, k, l, m, n, o, p, q, r, s, t, u, v, w, x, y, z, \alpha, \beta, \gamma, \delta, \epsilon, \zeta, \eta, \theta, \iota, \kappa, \lambda, \mu, \nu, \xi, \pi, \rho, \sigma, \tau, \upsilon, \phi, \chi, \psi, \omega$

- `\mm*`: Matrix Notations, alias of `\mathbf{*}`, `*` could be any English characters or Greek characters. For examples, `\mma` gets \mathbf{A} , and `\mmsigma` gets $\mathbf{\Sigma}$. The alphabet looks like this: $\mathbf{A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, P, Q, R, S, T, U, V, W, X, Y, Z, \Gamma, \Delta, \Theta, \Lambda, \Xi, \Pi, \Sigma, \Upsilon, \Phi, \Psi, \Omega}$
- `\mm*t`: Transposed Matrix Notations, alias of `\{\mathbf{*}\}^T`, `*` could be any English characters or Greek characters. For examples, `\mma` gets \mathbf{A}^T , and `\mmsigma` gets $\mathbf{\Sigma}^T$. The alphabet looks like this: $\mathbf{A}^T, \mathbf{B}^T, \mathbf{C}^T, \mathbf{D}^T, \mathbf{E}^T, \mathbf{F}^T, \mathbf{G}^T, \mathbf{H}^T, \mathbf{I}^T, \mathbf{J}^T, \mathbf{K}^T, \mathbf{L}^T, \mathbf{M}^T, \mathbf{N}^T, \mathbf{O}^T, \mathbf{P}^T, \mathbf{Q}^T, \mathbf{R}^T, \mathbf{S}^T, \mathbf{T}^T, \mathbf{U}^T, \mathbf{V}^T, \mathbf{W}^T, \mathbf{X}^T, \mathbf{Y}^T, \mathbf{Z}^T, \mathbf{\Gamma}^T, \mathbf{\Delta}^T, \mathbf{\Theta}^T, \mathbf{\Lambda}^T, \mathbf{\Xi}^T, \mathbf{\Pi}^T, \mathbf{\Sigma}^T, \mathbf{\Upsilon}^T, \mathbf{\Phi}^T, \mathbf{\Psi}^T, \mathbf{\Omega}^T$
- `\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, $d, \int_0^t f(\tau) d\tau$
- `\Diff`: Diff operator, $D, D^2 X = \frac{-x_{i+1,j} + 2x_{i,j} - x_{i-1,j}}{\Delta x^2}$
- `\Expect`: Expect operator, $E, X = B(n, p), E X = np$
- `\diag`, `\eig`, `\tr`: Matrix operators, $\text{diag}, \text{eig}, \text{tr}, \mathbf{D} = \text{diag } \mathbf{A}, [\mathbf{A}, \mathbf{V}] = \text{eig } \mathbf{A}, \text{tr } \mathbf{A} = \text{tr } \mathbf{A}$
- `\lcm`: lcm operator, $\text{lcm}, \text{lcm}(f, g) \cdot \text{gcd}(f, g) = f \cdot g$
- `\rand`: random number, rand
- `\mean`, `\var`: statistics operator, $\text{mean}, \text{var}, \mu = \text{mean } X, \sigma^2 = \text{var } X$
- `\corr`: correlation operator, $\text{corr}, \text{corr}(X, Y) = (R)_{ij} = \frac{\sum_{X_i, Y_j} (X - \bar{X})(Y - \bar{Y})}{\sqrt{\sum_i (X - \bar{X})^2 \sum_j (Y - \bar{Y})^2}}$
- `\conv`: convolution operator, $\text{conv}, \text{conv}(f, g) = \int_{-\infty}^{\infty} f(\tau)g(t - \tau) d\tau$
- `\card`: cardinals operator, $\text{card}, \text{card}\{1, 2, 3\} = 3, \text{card } \mathbb{R} = 2^{\aleph_0}$
- `\argmin`, `\argmax`, `\argopt`: argmin, argmax, argopt operator, $\hat{\theta} = \underset{\theta}{\text{argmin}} J_{\theta}(x)$
- `\dist`: distance operator, $\text{dist}, \min \sum_{\forall s, t \in G, s \neq t} \text{dist}(s, t)$
- `\abs{}`, `\norm{}`: norm operator, $|x + y| \leq |x| + |y|, \|\mathbf{Ax} + \mathbf{b}\|$
- `\normlp{}`: Lp-norm operator $\|1\|_2, \|\mathbf{Ax} + \mathbf{b}\|_2, \|\mathbf{Ax} + \mathbf{b}\|_{\infty}$

4 Useful Aliases and Generators

- `\fracdiffs{}`: frac & diff operator, also provide `\dffracdiffs{}` mode. For example, `\fracdiffs{x}` gets $\frac{d}{dx}$, `\fracdiffs{y}` gets $\frac{d}{dy}$, `\dffracdiffs{z}` gets $\frac{d}{dz}$
- `\fracdiffd{}`: frac & diff operator, also provide `\dffracdiffd{}` mode. For example, `\fracdiffd{u}{x}` gets $\frac{du}{dx}$, `\dffracdiffd{^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
$$\begin{cases} x + y = 10 \\ 4x + 2y = 30 \end{cases}$$