Math-Symbols-in-LaTeX

polossk

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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`, $\mathbb{R}$
- `\mhilb`: alias of `\mathbb H`, $\mathbb{H}$
- `\mcond`: alias of `\mathrm {Cond.}`, Cond.
- `\mconst`: alias of `\mathrm {const}`, const

2 Vector and Matrix Defination

- `\mv*`: Vector Notations, alias of `\bm *`, `*` could be any English characters or Greek characters. For examples, `\mva` gets $\boldsymbol{a}$, and `\mvalpha` gets $\boldsymbol{\alpha}$. The alphabet looks like this: $\boldsymbol{a}$, $\boldsymbol{b}$, $\boldsymbol{c}$, $\boldsymbol{d}$, $\boldsymbol{e}$, $\boldsymbol{f}$, $\boldsymbol{g}$, $\boldsymbol{h}$, $\boldsymbol{i}$, $\boldsymbol{j}$, $\boldsymbol{k}$, $\boldsymbol{l}$, $\boldsymbol{m}$, $\boldsymbol{n}$, $\boldsymbol{o}$, $\boldsymbol{p}$, $\boldsymbol{q}$, $\boldsymbol{r}$, $\boldsymbol{s}$, $\boldsymbol{t}$, $\boldsymbol{u}$, $\boldsymbol{v}$, $\boldsymbol{w}$, $\boldsymbol{x}$, $\boldsymbol{y}$, $\boldsymbol{z}$, $\boldsymbol{\alpha}$, $\boldsymbol{\beta}$, $\boldsymbol{\gamma}$, $\boldsymbol{\delta}$, $\boldsymbol{\epsilon}$, $\boldsymbol{\zeta}$, $\boldsymbol{\eta}$, $\boldsymbol{\theta}$, $\boldsymbol{\iota}$, $\boldsymbol{\kappa}$, $\boldsymbol{\lambda}$, $\boldsymbol{\mu}$, $\boldsymbol{\nu}$, $\boldsymbol{\xi}$, $\boldsymbol{\pi}$, $\boldsymbol{\rho}$, $\boldsymbol{\sigma}$, $\boldsymbol{\tau}$, $\boldsymbol{\upsilon}$, $\boldsymbol{\phi}$, $\boldsymbol{\chi}$, $\boldsymbol{\psi}$, $\boldsymbol{\omega}$
- `\mm*`: Matrix Notations, alias of `\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: $\mathbf{A}$, $\mathbf{B}$, $\mathbf{C}$, $\mathbf{D}$, $\mathbf{E}$, $\mathbf{F}$, $\mathbf{G}$, $\mathbf{H}$, $\mathbf{I}$, $\mathbf{J}$, $\mathbf{K}$, $\mathbf{L}$, $\mathbf{M}$, $\mathbf{N}$, $\mathbf{O}$, $\mathbf{P}$, $\mathbf{Q}$, $\mathbf{R}$, $\mathbf{S}$, $\mathbf{T}$, $\mathbf{U}$, $\mathbf{V}$, $\mathbf{W}$, $\mathbf{X}$, $\mathbf{Y}$, $\mathbf{Z}$, $\mathbf{\Gamma}$, $\mathbf{\Delta}$, $\mathbf{\Theta}$, $\mathbf{\Lambda}$, $\mathbf{\Xi}$, $\mathbf{\Pi}$, $\mathbf{\Sigma}$, $\mathbf{\Upsilon}$, $\mathbf{\Phi}$, $\mathbf{\Psi}$, $\mathbf{\Omega}$
- `\mm*t`: Transposed Matrix Notations, alias of `\{\mathbf *}^T`, `*` could be any English characters or Greek characters. For examples, `\mma` gets $\mathbf{A}$, and `\mmsigma` gets $\mathbf{\Sigma}$. The alphabet looks like this: $\mathbf{A}^T$, $\mathbf{B}^T$, $\mathbf{C}^T$, $\mathbf{D}^T$, $\mathbf{E}^T$, $\mathbf{F}^T$, $\mathbf{G}^T$, $\mathbf{H}^T$, $\mathbf{I}^T$, $\mathbf{J}^T$, $\mathbf{K}^T$, $\mathbf{L}^T$, $\mathbf{M}^T$, $\mathbf{N}^T$, $\mathbf{O}^T$, $\mathbf{P}^T$, $\mathbf{Q}^T$, $\mathbf{R}^T$, $\mathbf{S}^T$, $\mathbf{T}^T$, $\mathbf{U}^T$, $\mathbf{V}^T$, $\mathbf{W}^T$, $\mathbf{X}^T$, $\mathbf{Y}^T$, $\mathbf{Z}^T$, $\mathbf{\Gamma}^T$, $\mathbf{\Delta}^T$, $\mathbf{\Theta}^T$, $\mathbf{\Lambda}^T$, $\mathbf{\Xi}^T$, $\mathbf{\Pi}^T$, $\mathbf{\Sigma}^T$, $\mathbf{\Upsilon}^T$, $\mathbf{\Phi}^T$, $\mathbf{\Psi}^T$, $\mathbf{\Omega}^T$
- `\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, $\int_0^t f(\tau)\,\mathrm{d}\tau$
- `\Diff`: Diff operator, $\mathrm{D}^2 X = \dfrac{-x_{i+1,j} + 2x_{i,j} - x_{i-1,j}}{\Delta x^2}$

- `\Expect`: Expect operator, $X = B(n, p)$, $\mathrm{E}\, X = np$
- `\diag`, `\eig`, `\tr`: $\mathbf{D} = \operatorname{diag} \mathbf{A}$, $[\mathbf{\Lambda}, \mathbf{V}] = \operatorname{eig} \mathbf{A}$, $\operatorname{tr} \mathbf{\Lambda} = \operatorname{tr} \mathbf{A}$
- `\lcm`: lcm operator, $\operatorname{lcm}(f, g) \cdot \gcd(f, g) = f \cdot g$
- `\rand`: random number, rand
- `\mean`, `\var`: statistics operator, $\mu = \operatorname{mean} X$, $\sigma^2 = \operatorname{var} X$
- `\corr`: correlation operator, $\operatorname{corr}(X, Y) = (R)_{ij} = \dfrac{\sum_{X_i, Y_j} (X - \bar{X})(Y - \bar{Y})}{\sqrt{\sum_i (X - \bar{X})^2 \sum_j (Y - \bar{Y})^2}}$
- `\conv`: convolution operator, $\operatorname{conv}(f, g) = \int_{-\infty}^{\infty} f(\tau) g(t - \tau)\, \mathrm{d}\tau$
- `\card`: cardinals operator, $\operatorname{card}\{1, 2, 3\} = 3$, $\operatorname{card} \mathbb{R} = 2^{\aleph_0}$
- `\argmin`, `\argmax`, `\argopt`: arg min, arg max, arg opt operator, $\hat{\theta} = \operatorname*{argmin}_{\theta} J_\theta(x)$
- `\dist`: distance operator, $\min \sum_{\forall s, t \in G} \operatorname{dist}_{s \neq t}(s, t)$

4 Useful Alias

- `\fracpartials{#1}`: frac & partial operator, also provide `\dfracpartials{#1}` mode. For example, `\fracpartials{x}` gets $\frac{\partial}{\partial x}$, `\dfracpartials{y}` gets $\dfrac{\partial}{\partial y}$
- `\fracpartiald{#1}{#2}`: frac & partial operator, also provide `\dfracpartiald{#1}{#2}` mode. For example, `\fracpartiald{u}{x}` gets $\frac{\partial u}{\partial x}$, `\dfracpartiald{^2u}{x^2}` gets $\dfrac{\partial^2 u}{\partial x^2}$
- `\fracdiffs{#1}`: frac & diff operator, also provide `\dfracdiffs{#1}` mode. For example, `\fracdiffs{x}` gets $\frac{\mathrm{d}}{\mathrm{d}x}$, `\fracdiffs{y}` gets $\frac{\mathrm{d}}{\mathrm{d}y}$, `\dfracdiffs{z}` gets $\dfrac{\mathrm{d}}{\mathrm{d}z}$
- `\fracdiffd{#1}{#2}`: frac & diff operator, also provide `\dfracdiffd{#1}{#2}` mode. For example, `\fracdiffd{u}{x}` gets $\frac{\mathrm{d}u}{\mathrm{d}x}$, `\dfracdiffd{^2u}{x^2}` gets $\dfrac{\mathrm{d}^2 u}{\mathrm{d}x^2}$