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Symbol Index

Symbol	Meaning	Page(s)
$c + d$	addition of scalars	8
$A + B$	addition of matrices	5
$\mathbf{v} + \mathbf{w}$	addition of vectors	5, 76
$V + W$	addition of subspaces	86
$f + g$	addition of functions	79
cd	multiplication of scalars	8
$c\mathbf{v}$, cA , cf	scalar multiplication	5, 76, 79
AB , $A\mathbf{x}$	matrix and vector multiplication	6
$K > 0$	positive definite	157, 398
$K \geq 0$	positive semi-definite	159
$ \cdot $	absolute value, modulus, norm	<i>xvii</i> , 137, 174
$\ \cdot\ $	norm	131, 133, 144, 178–9
$\ \cdot\ $	matrix norm	153
$\ \cdot\ _1$	1 norm	145, 155
$\ \cdot\ _2$	Euclidean norm	145, 460
$\ \cdot\ _\infty$	max norm	145, 155
$\ \cdot\ _p$	p norm	145
$\ \cdot\ _{p,w}$	weighted p norm	147
$\ \cdot\ _F$	Frobenius norm	156
$\mathbf{v} \cdot \mathbf{w}$	dot product	130
$\mathbf{z} \cdot \mathbf{w}$	Hermitian dot product	178
$\langle \cdot, \cdot \rangle$	inner product	130, 133, 179
$\langle\langle \cdot, \cdot \rangle\rangle$	inner product	133
$\langle\langle\langle \cdot, \cdot \rangle\rangle\rangle$	inner product	133
$[\cdot, \cdot]$	commutator	10, 354
$[a, b]$	closed interval	<i>xvii</i> , 79
(a, b)	open interval	79
$[a, b)$, $(a, b]$	half open interval	79
$\{x \mid C\}$	set of all x subject to conditions C	<i>xvii</i>
$x \simeq y$	approximate equality of real numbers	55
$V \simeq W$	isomorphic vector spaces	356
V / W	quotient vector space	57

#	cardinality (number of elements)	<i>xvii</i>
\cup	union	<i>xvii</i>
\cap	intersection	<i>xvii</i>
\in	element of	<i>xvii</i>
\notin	not element of	<i>xvii</i>
$\subset, \subseteq, \subsetneq$	subset	<i>xvii</i>
\supset	superset	<i>xvii</i>
\setminus	set theoretic difference	<i>xvii</i>
$\binom{n}{k}$	binomial coefficient	58, 393
\mathbf{u}^\perp	orthogonal complement to vector	208
W^\perp	orthogonal complement	217
\sphericalangle	angle	137
$f: X \rightarrow Y$	function	<i>xvii</i>
$x_n \rightarrow x$	convergent sequence	<i>xvii</i>
\equiv	equality of functions	<i>xvii</i>
\circ	composition	<i>xvii</i> , 352
\times	Cartesian product	81
\times	cross product	140, 187
\sim	agreement at sample points	287
\sim_W	equivalence relation	87
$[\cdot]_W$	equivalence class	87
\bar{x}, \bar{f}	mean or average	84, 467
\bar{z}, \bar{z}	complex conjugate	173, 177, 390
\bar{q}	quaternion conjugate	365
$\sum_{i=1}^n$	summation	<i>xvii</i>
$\prod_{i=1}^n$	product	<i>xvii</i>
u', u'', \dots	space derivatives	<i>xviii</i> , 173
\dot{u}, \ddot{u}, \dots	time derivatives	<i>xviii</i> , 600
$\frac{du}{dx}, \frac{d^2u}{dx^2}, \dots$	ordinary derivatives	<i>xviii</i> , 585
$\frac{\partial u}{\partial x}, \frac{\partial^2 u}{\partial x^2}, \frac{\partial^2 u}{\partial x \partial t}, \dots$	partial derivatives	<i>xviii</i>
∂_x	partial derivative operator	349
∇	gradient	349
$\nabla \cdot$	divergence	86
$\int f(x) dx$	indefinite integral	<i>xviii</i>
$\int_a^b f(x) dx$	definite integral	<i>xviii</i>

$\mathbf{0}$	zero vector	7
A^{-1}, L^{-1}	inverse matrix, linear function	31, 355
A^T	transpose matrix	43, 502
A^{-T}	inverse transpose matrix	44
A^\dagger	Hermitian transpose matrix	181, 444
A^+	pseudoinverse matrix	437
A^*, L^*	adjoint matrix, linear function	395, 399
L^*	dual linear function	369
V^*	dual vector space	350
A	space of analytic functions	84
$(A \mid \mathbf{b})$	augmented matrix	12
a_{ij}	matrix entry	<i>xvii</i> , 4
B_1	unit ball	148
\mathbb{C}	complex numbers	<i>xvii</i> , 173
\mathbb{C}^n	n -dimensional complex space	177
C_j	cardinal spline	284
C^0	space of continuous functions	83, 179, 347
C^n	space of continuously differentiable functions	84
C^∞	space of smooth functions	84
coker	cokernel	113, 357
coimg	coimage	113, 357
cos	cosine function	<i>xvii</i> , 176
cosh	hyperbolic cosine function	176
D	derivative operator	348
$d(\mathbf{v}, \mathbf{w})$	distance	146
D_A	Gerschgorin domain	420
D_A^*	refined Gerschgorin domain	422
D_k	Gerschgorin disk	420
D^k	k^{th} derivative operator	353
$\mathcal{D}^{(k)}$	space of k^{th} order differential operators	355
det	determinant	32, 70
diag	diagonal matrix	8
dim	dimension	100
e	base of natural logarithm	<i>xvii</i>
e^x	exponential function	<i>xvii</i>
e^z	complex exponential	175
e^A	matrix exponential	593
\mathbf{e}_i	standard basis vector	36, 99
E_i	elementary matrix	16
\mathcal{F}	function space	79, 80
G_n	complete graph	127, 464

$G_{m,n}$	complete bipartite digraph	127
\mathbb{H}	quaternions	364
H^1	Sobolev norm	136
H_n	Hilbert matrix	57
$i = \sqrt{-1}$	imaginary unit	<i>xvii</i> , 173
i	unit quaternion	364
\mathbf{i}	standard basis vector in \mathbb{R}^3	99
I, I_n	identity matrix	7
I, I_V	identity function	343
img	image	105, 383
Im	imaginary part	173, 177, 391
index	index of linear map	357
j	unit quaternion	364
\mathbf{j}	standard basis vector in \mathbb{R}^3	99
$J_{a,n}, J_{\lambda,n}$	Jordan block matrix	416, 449
k	unit quaternion	364
\mathbf{k}	standard basis vector in \mathbb{R}^3	99
ker	kernel	105, 378
L^2	Hilbert space, inner product, norm	133, 180
L^p	function space p norm	145
L_k	Lagrange polynomial	262
$L[\mathbf{v}]$	linear function	342
$\mathcal{L}(V, W)$	space of linear functions	349
log	natural (base e) logarithm	<i>xvii</i>
\log_a	base a logarithm	<i>xvii</i>
m_A	minimal polynomial	453
max	maximum	<i>xvii</i>
min	minimum	<i>xvii</i>
$\mathcal{M}_{m \times n}$	space of $m \times n$ matrices	77, 349
mod	modular arithmetic	<i>xvii</i>
$O, O_{m \times n}$	zero matrix	7
\mathcal{O}^+	nonnegative orthant	83
p_A	characteristic polynomial	415
P_k	Legendre polynomial	228
$\mathcal{P}^{(n)}$	space of polynomials of degree $\leq n$	77
$\mathcal{P}^{(\infty)}$	space of all polynomials	83
ph	phase	<i>xvii</i> , 174
\mathbb{Q}	rational numbers	<i>xvii</i>
\mathbb{R}	real numbers	<i>xvii</i>
\mathbb{R}^n	n -dimensional real Euclidean space	76
\mathbb{R}^∞	space of infinite sequences	81

R_θ	rotation	349
rank	rank	61
Re	real part	173, 177, 391
S_1	unit sphere	83, 148
S_j	sinc function	273
sec	secant function	<i>xvii</i>
sech	hyperbolic secant function	270
sign	sign of permutation	72
sin	sine function	<i>xvii</i> , 176
sinh	hyperbolic sine function	176
span	span	87
supp	support of a function	551
\mathbf{t}_k	monomial sample vector	265
T_k	Chebyshev polynomial	233
$\mathcal{T}^{(n)}$	space of trigonometric polynomials of degree $\leq n$	90, 190
$\mathcal{T}^{(\infty)}$	space of all trigonometric polynomials	91
tan	tangent function	<i>xvii</i>
tr	trace	10, 415
$V^{(k)}$	Krylov subspace	537
\mathbb{Z}	integers	<i>xvii</i>
β	B -spline	284
Δ	Laplacian	349, 381
$\boldsymbol{\varepsilon}_j$	dual basis vectors	350
ζ_n	primitive root of unity	288
κ	condition number	460
λ	eigenvalue	408
π	area of unit circle	<i>xvii</i>
π	permutation	26, 27
ρ	spectral radius	489
ρ_{xy}	correlation	469
σ_i	singular value	454
σ_x	standard deviation	468
σ_{xy}	covariance	469
ω	relaxation parameter	518
$\boldsymbol{\omega}_k$	sampled exponential	287

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