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Symbol Index

Symbol	Description and page number(s)
\mathcal{A}	algebra of differential functions 288
\mathcal{A}^m	space of m -tuples of differential functions 288
Ad	adjoint representation 199
Ad*	co-adjoint representation 406
ad v	adjoint vector field 200
ad* v	co-adjoint vector field 406
Ai	Airy function 209
B	Poisson map on cotangent space 399
Bi	Airy function 209
C	distinguished function 392, 410
\mathcal{C}	distinguished functional 446
\mathcal{C}	formal conservation law 349
C^k	space of k -times differentiable functions 4
C^∞	space of smooth functions 4
c_{jk}^i	structure constant 50
cn	Jacobi elliptic function 194
Curl	total curl 265
d	differential 32, 54, 57
\hat{d}	vertical differential 353
\mathbf{d}	dilatational vector field 124
D	total differential 351, 369
\mathcal{D}	dilatational symmetry operator 306
\mathcal{D}	differential operator 168, 308, 318
\mathcal{D}	Hamiltonian operator 435
\mathcal{D}^*	adjoint differential operator 328, 329
\mathcal{D}	pseudo-differential operator 319
\mathcal{D}	formal symmetry 323, 349
\mathcal{D}^{-1}	inverse of pseudo-differential operator 320
$\sqrt[n]{\mathcal{D}}$	n -th root of pseudo-differential operator 321
$\mathcal{D}^{i/n}$	fractional power of pseudo-differential operator 321

D_i or D_x	total derivative 109, 289, 318, 355, 369
D_x^{-1}	inverse total derivative operator 313, 319
D_J	higher order total derivative 109
$(-D)_J$	signed higher order total derivative 245
D_P	Fréchet derivative of differential function P 307
D_P^*	adjoint of Fréchet derivative 329
D_{x^ζ}	total Jacobian matrix 233
$D(\eta^1, \dots, \eta^p)/D(x^1, \dots, x^p)$	total Jacobian determinant 240, 387
dx^i	basis differential one-form 54, 351
$dx^{\hat{i}}$	basis differential $(m - 1)$ -form 59
$dx^{\hat{j}}$	basis differential $(m - 2)$ -form 60
dx^j	basis differential form 55, 351
du_j^i	basis vertical one-form 353, 440
\det	determinant 14
div	divergence 59, 74
Div	total divergence 248, 289, 352, 357
e	identity element of group 14
E	Euler operator 246, 289, 329, 363, 369
E_a	Euler operator 246
E_a^j	higher Euler operator 365
$E^{(k)}$	higher Euler operator 366
$E(m)$	Euclidean group of \mathbb{R}^m 71, 73
e^{tA}	matrix exponential 29
erf	error function 157
\exp	exponential map 48
$\exp(\operatorname{ev})$	flow of vector field v 28
$\exp(\operatorname{ev})$	one-parameter subgroup 45
$\exp(\operatorname{ev}_Q)$	flow of evolutionary vector field v_Q 297, 380, 388
\mathcal{F}	space of functionals 356
G	Lie group 15, 90
G^+	identity component of Lie group 17
g	Lie algebra 42, 43, 49, 52
g^*	dual to Lie algebra 397
G_c	translation group 77
$G^{(r)}$	subgroup of solvable group 151
$g^{(r)}$	subalgebra of solvable Lie algebra 151
G_x	local group of transformations defined at x 21
G^x	isotropy group 73
g^x	isotropy subalgebra 73
G^x	scaling group 77
G_a	residual symmetry group 422
g_a	isotropy subalgebra 422
$g \cdot f$	transformed function 90
G/H	quotient group 72
$\operatorname{GL}(n)$ or $\operatorname{GL}(n, \mathbb{R})$	general linear group of \mathbb{R}^n 14
$\operatorname{GL}^+(n)$	identity component of general linear group 17
$\operatorname{gl}(n)$	Lie algebra of $n \times n$ matrices 44
$\operatorname{GL}(m, n)$	space of $m \times n$ matrices of maximal rank 69
$\operatorname{Grass}(m, n)$	Grassmann manifold 69
$\operatorname{Grass}(p, M)$	Grassmann bundle 240
h	homotopy operator 63, 64
h	variational homotopy operator 362
\hat{h}	vertical homotopy operator 354
H	Hamiltonian function 392, 395
H and H^*	total homotopy operators 372

\mathcal{H}	system of vector fields 39, 400
\mathcal{H}^*	Hamiltonian functional 435
\mathbb{H}^m	upper half space 66
$\mathcal{H} _x$	space of Hamiltonian vector fields 400
He_n	Hermite polynomial 192
i	group inverse 15, 18
I	inversion 73, 125
I	identity matrix 14
$I^{(n)}$	invariant space 224, 229
$\tilde{I}^{(n)}$	“nice” invariant space 231
$I_*^{(n)}$	extended invariant space 224
$ _Q$	total interior product operator 369
$ _u$	total interior product operator 372
i_x	inversional vector field 124
\mathcal{J}_x	inversional symmetry operator 306
J	structure matrix for Poisson bracket 394, 432
\tilde{J}	transformed multi-index 98, 366
$J!$ or $\tilde{J}!$	multi-index factorial 98, 366
J or J_Δ	Jacobian matrix 103, 111, 232, 250
J^{ij}	structure function for Poisson bracket 394
K	symplectic structure matrix 400, 430
K_g	conjugation map 199
$\mathcal{K} _x$	kernel of Poisson map \mathbf{B} 400
$\mathcal{L}[u] = \int L dx$	functional 243, 356
m	group operation 15, 18
\mathbf{m}	dilatational vector field 256
M	manifold 3
M	open subset of space of independent and dependent variables 90
\mathbf{M}	matrix for characteristics 164
\mathcal{M}	dilatational symmetry operator 340
M_g	domain of definition of transformation g 21
M_x	vertical slice 352
$M^{(n)}$	jet space 96, 112, 220
$M_*^{(n)}$	extended jet space 220
$M_{n \times n}$	space of $n \times n$ matrices (see $gl(n)$) 15
M/G	quotient manifold 210
$(M/G)^{(n)}$	jet space of quotient manifold 231
$\widehat{(M/G)}^{(n)}$	“nice” jet space of quotient manifold 231
$(M/G)_*^{(n)}$	extended jet space of quotient manifold 226
mod	modular addition 7
\emptyset	orbit 22
$O(n)$	orthogonal group 15
$O(\varepsilon^n)$	order of vanishing 27
order	order of pseudo-differential operator 320
P	momentum map 421
p_k	binomial coefficient 95
$p^{(n)}$	binomial coefficient 95
$\text{pr}^{(n)} f$	prolongation of function f 96, 220
$\text{pr}^{(n)} g$	prolongation of group transformation g 98, 223
$\text{pr}^{(n)} G$	prolongation of group G 98, 223
$\text{pr}^{(n)} \mathbf{v}$	prolongation of vector field \mathbf{v} 101, 110, 224, 289
$\text{pr } \mathbf{v}$	prolongation of (generalized) vector field \mathbf{v} 289–291, 388
$\text{pr } \mathbf{v}_Q$	prolongation of evolutionary vector field 291, 369

$\text{pr } v_Q(\mathcal{D})$	Lie derivative of differential operator 308
$\text{pr}^{(n)} \Gamma$	prolongation of submanifold Γ 220
\dot{Q} or Q_x	characteristic of vector field 115, 291
Q or Q_x	characteristic of conservation law 266, 330
\mathbb{Q}	rational numbers 14
\mathcal{R}	recursion operator 304, 323, 455
\mathcal{R}	hereditary operator 315
\mathbf{R}	Runge–Lenz vector 335, 379
\mathbb{R}	real numbers 7, 14, 43
\mathbb{R}^+	positive real numbers 16
R_g	right multiplication map 42
\mathbb{R}^m	m -dimensional Euclidean space 2, 15
\mathbf{r}_{xy}	rotational vector field 124, 129
\mathcal{R}_{xy}	rotational symmetry operator 306
\mathbb{RP}^m	real projective space 69
\mathcal{S}_F	subvariety determined by function F 77
S^m	m -dimensional sphere 4
\mathcal{S}_α	level set of momentum map 422
\mathcal{S}_Δ	subvariety for system of differential equations 97, 222
\mathcal{S}_Δ^*	extended subvariety for system of differential equations 222
$\mathcal{S}_{\Delta/G}$	reduced subvariety 235
$\mathcal{S}_{\Delta/G}^*$	reduced subvariety 227
$\text{SL}(n)$ or $\text{SL}(n, \mathbb{R})$	special linear group of \mathbb{R}^n 18
$\mathfrak{sl}(n)$	special linear Lie algebra 51
sn	Jacobi elliptic function 415
$\text{SO}(n)$	special orthogonal group 16
$\mathfrak{so}(n)$	Lie algebra of skew-symmetric matrices 47
$\text{SO}(p, q)$	special orthogonal group 177
$\text{Sp}(n)$	symplectic group 71
T	matrix transpose 15
T_0	space of evolutionary vector fields 355, 441
T^m	m -dimensional torus 5, 16
$T(n)$	group of upper triangular matrices 6
TM	tangent bundle of M 25
$TM _x$	tangent space of M at x 25
T^*M	cotangent bundle of M 54
$T^*M _x$	cotangent space of M at x 54
u or u^α	dependent variables 90
$[u]$	dependence on derivatives 288
\mathcal{U}	domain of transformation group 20
U	space of dependent variables 90
\mathbf{U}	parabolic cylinder function 192
u_i	ordinary derivative of u : $d^i u / dx^i$ 137, 246
u_i	partial derivative of u : $\partial u / \partial x^i$ 106
U_n	space of partial derivatives 95
$u^{(n)}$	partial derivatives of u up to order n 95
$U^{(n)}$	jet space 95
U_z	vertical space 219
U_α	coordinate chart 3
u_i^α	partial derivative of u : $\partial u^\alpha / \partial x^i$ 110
u_j^α	partial derivative of u : $\partial_j u^\alpha$ 95
$u_{j,i}^\alpha$	partial derivative of u : $\partial u^\alpha / \partial x^i$ 109
u_m^α	partial derivative of u : $\partial^m u^\alpha / \partial t^m$ 162

$u_{mt,J}^a$	partial derivative of u : $\partial_J(\partial^m u^a / \partial t^m)$ 163
V	local Lie group 18
\mathbf{V}	parabolic cylinder function 192
\mathbf{v}	vector field; element of Lie algebra 26, 42, 52, 102
\mathbf{v}^*	generalized vector field 289
\mathbf{v}^*	exponential vector field 181
\mathbf{v}_0	scaling vector field 64
$\mathbf{v}_{\mathcal{D}\theta}$	formal evolutionary vector field 441
$\mathbf{v}(f)$	Lie derivative of function f 30
$\mathbf{v}(\omega)$	Lie derivative of differential form ω 60
\mathbf{v}_H	Hamiltonian vector field 392
\mathbf{v}_x	Hamiltonian vector field 435
$\mathbf{v}^{(n)}$	vertical subvariety 221
$\tilde{\mathbf{v}}^{(n)}$	“nice” singular subvariety 231
\mathbf{v}_Q	evolutionary vector field 116, 291
$\mathbf{v}_Q[\mathcal{D}]$	(1, 1) Lie derivative 310, 323
\mathbf{v}_u	scaling vector field 354
$\mathbf{v} _x$	tangent vector at x 24
\mathbf{v}_α	linear symmetry group generator 118
\mathbf{v}_α	moving coordinate group generator 129
$(\mathcal{Y}/G)^{(n)}$	quotient singular subvariety 231
$(\mathcal{Y}/G)^{(n)}$	“nice” quotient singular subvariety 231
Vol	volume 74
W	parabolic cylinder function 208
x	local coordinates 6
x or x^i	independent variables 90
\hat{x}	parametric variables 86, 186, 189
X	space of independent variables 90
x^j	product of independent variables 98
\mathbb{Z}	integers 14
1 or 1_X	identity map (of space X) 4, 92
$(-1)^\pi$	sign of permutation π 54
Γ_f	graph of function f 90, 219
$\Gamma_f^{(n)}$	graph of prolonged function 97
δ	variational derivative 245
δ	variational differential 361
δ_a or $\delta/\delta u^a$	variational derivative 245
δ_j^i	Kronecker symbol 54, 391
Δ	system of differential equations 97, 290
Δ	linear differential operator 306, 336
Δ	Laplacian 247
Δ/G	reduced system of differential equations 188, 235
$\Delta^{(k)}$	prolonged system of differential equations 166
$\Delta(x, u^{(n)}) = 0$	differential equation 97
Θ	Poisson bi-vector 432, 441
θ_j^a	basis vertical uni-vector 440
κ	curvature 113
ξ^i	coefficient of vector field 26, 102, 289
π	permutation 54
π	projection to quotient manifold 210
π^k	power product 215
$\pi^{(n)}$	extended jet space projection 226
π_k^n	jet space projection 100, 220
ϕ_α	coefficient of vector field 102, 289