

ϕ_j^z	coefficient of prolonged vector field 102, 110, 289
χ_α	coordinate map 3
ψ	infinitesimal group generator map 51
Ψ	transformation group map or flow 21, 27, 51
Ψ	Jacobi identity tri-vector 441
ω	differential form 54
ω	total differential form 351
ω	functional form 358
$\hat{\omega}$	vertical form 353
Ω	domain of integration 243
Ω	symplectic two-form 430
∂	boundary 66, 248
∂_I	higher order partial derivative 95
∂_k	partial derivative 74
∂_x	partial derivative (also subscript: u_x) 8, 28, 96
$\partial/\partial n$	normal derivative 165
$\partial/\partial u_j^z$	partial derivative 101, 288, 440
$\partial/\partial x$	partial derivative 7, 288
$\partial/\partial x^i$ or ∂_i	basis tangent vector 24, 54
$\partial u/\partial x$	Jacobian matrix 187, 232
∇f	gradient of f 12, 244, 394, 396
∇u	deformation gradient 275
$\nabla \times \mathbf{f}$	curl of \mathbf{f} 58
$\nabla \cdot \mathbf{f}$	divergence of \mathbf{f} 58
$\int L \, dx$	functional 243, 356
$\int P \cdot dS$	boundary integral 248
$\int \omega$	integral of differential form 66
$\int \hat{\omega} \, dx$	functional form 357
*	pull-back 56, 60
*	adjoint 328
*	dual vector space 396
\wedge	wedge product 55, 351, 353
\bigwedge_k	space of smooth differential k -forms 58
\bigwedge_r	space of total r -forms 352
\bigwedge^k	space of vertical k -forms 354
\bigwedge^k_*	space of functional k -forms 357
\bigwedge^*_k	space of functional multi-vectors 440
$\bigwedge_k T^*M _x$	space of differential k -forms at x in M 53
\lrcorner	interior product 56, 354
\emptyset	empty set 3
\cap	set-theoretic intersection 3
\cup	set-theoretic union 3
\subset	set-theoretic inclusion 2
\subset	multi-index inclusion 366
\setminus	set-theoretic difference 4
\setminus	difference between multi-indices 300, 366
\in	element of 3
\bar{S}	closure of set S 172
\times	Cartesian product 5, 16, 90
\times	cross product in \mathbb{R}^3 71
\ltimes	semi-direct product 71
\circ	composition of functions 3
$ $	evaluation 24, 25, 28

- $\#J$
- $|v|$
- $\binom{I}{J}$
- (a, b)
- $[a, b]$
- $[v, w]$
- $[A, B]$
- $[\mathcal{D}, \mathcal{E}]$
- $[\theta, \zeta]$
- $[\lambda, \mu, v]$
- $[\cdot]$
- $\{F, H\}$
- $\{\mathcal{P}, \mathcal{Q}\}$
- $\langle \cdot, \cdot \rangle$
- $\langle \cdot; \cdot \rangle$
- $\langle \cdot; \cdot \rangle$
- order of multi-index 95
- metric 73
- bi- or multi-nomial coefficient 55, 366
- open interval 7
- closed interval 13
- Lie bracket 33, 43, 301, 393, 447
- matrix commutator: $BA - AB$ 44
- commutator operator 320
- Schouten bracket 432
- homogeneous coordinates 222
- $(1, 1)$ Lie derivative 310, 323
- Poisson bracket 390, 432
- Poisson bracket 435
- inner product 244
- pairing of vector space and its dual 54, 397
- evaluation of multi-linear map 54, 355, 358, 440

Author Index

- Abellanas, L., 377
Ablowitz, M. J., 236, 237
Abraham, R., 68, 427
Abramowitz, M., 192, 208
Adams, M., 377
Adler, M., 377, 462, 463
Ado, I. D., 47, 68
Akhatov, I. S., 376
Aldersley, S. J., 379
Alonso, L. M., vii, 282, 379
Ames, W. F., 173, 175, 237
Anderson, I. M., viii, ix, 243, 376, 378, 379, 386
Anderson, R. L., xxiii, 375, 380, 384
Appell, P., 173
Arnol'd, V. I., 427, 429, 431, 462, 466
Astashov, A. M., 463
Atherton, R. W., 378, 384
- Bäcklund, A. V., 175, 286, 375, 376
Baikov, V. A., 376
Baker, J. W., 283, 383
Bakirov, I. M., 381
Barenblatt, G. I., 236
Bargmann, V., 67
Bateman, H., 173, 384
Benjamin, T. B., ix, xxiii, 175, 281
Berezin, F. A., 427
Berker, R., 197, 236
Bessel-Hagen, E., 282, 328, 377
Bianchi, L., 173
- Bilby, B. A., 281
Birkhoff, G., ix, xviii, 67, 173, 236, 238
Blasius, H., 236
Bluman, G. W., vii, xxiii, 173, 174, 177, 179, 237, 240, 328, 376, 380
Boltzmann, L., 236, 238
Boothby, W. M., 8, 10, 67, 70
Born, M., 464
Bott, R., 59, 69
Bourlet, M. C., 175
Boyer, C. P., 174, 376
Broer, L. J. F., 462, 465
Brown, A. B., 172
Buchnev, A. A., 174, 177
- Carathéodory, C., 172, 427
Carmichael, R. D., 173
Carnevale, G., 237
Cartan, E., xviii, 67–69, 175, 431
Champagne, B., vii, 174
Chekanov, Y. V., 464
Chen, H. H., 376
Chevalley, C. C., 68
Clarkson, P., 238
Cohen, A., 72, 173, 180, 284
Cole, J. D., xxiii, 173, 177, 237, 240
Cooke, D. B., 463
Copson, E. T., 376
Courant, R., 258
Crampin, M., 463
Cunningham, E., 173

- Darboux, G., 172, 405, 427, 462
 Dedecker, P., 378
 Delassus, E., 175
 Delong, R. P., Jr., 307, 376, 377
 Dikii (Dickey), L. A., 311, 321, 377, 378,
 381, 382, 462, 463
 DiPerna, R. J., 281
 Dirac, P. A. M., 427
 Dorfman, I. Ya., 462, 463
 Dorodnitsyn, V. A., xxiii
 Douglas, J., 378, 386
 Doyle, P., 463
 Dresner, L., 238, 284
 Driessel, K., viii
 Drinfel'd, V. G., 463
 Dubrovin, B. A., 463
 Duchamp, T. E., 378, 379, 386
- Edelen, D. G. B., 175, 377
 Ehresmann, C., 174
 Einstein, A., 175, 282
 Eisenhart, L. P., 73, 173, 174, 176
 Elkana, Y., 281
 Engel, F., 282
 Ericksen, J. L., 236
 Eshelby, J. D., 276, 282
 Estabrook, F. B., xxi, 175
 Euler, L., 281
- Fadeev, L. D., 462
 Falkner, V. M., 236
 Finzi, A., 168, 169, 175, 182
 Fletcher, D. C., 282, 464
 Fletcher, J. G., 281
 Fokas, A. S., 179, 375–377, 381, 430, 463
 Fomenko, A. T., 428, 429
 Fomin, S. V., 281
 Forsyth, A. R., 172, 174, 376, 427
 Frobenius, G., 67, 68, 172, 405
 Fuchssteiner, B., 302, 376, 381, 463
 Fushchich, V. I., 178, 375, 376
- Galaktionov, V. A., 238
 Galindo, A., 377, 379
 Gardner, C. S., 376, 379, 462
 Gazizov, R. K., 376
 Gel'fand, I. M., 281, 321, 377, 378, 381,
 382, 462, 463
 Goff, J. A., 173, 177
 Goldberg, J. N., 281, 345
 Goldschmidt, H., 175
- Goldstein, H., 379, 427, 428
 Golubitsky, M., 174, 237
 González–Gascon, F., 180
 González–López, A., 180
 Gorenstein, D., 13
 Gragert, P. H. K., 175
 Grassmann, H., 68
 Greene, J. M., 376
 Guillemin, V., 174, 237
 Günther, W., 282
- Hadamard, J. S., 175
 Hamilton, W. R., 427
 Harleston, H., 463
 Harrison, B. K., 175
 Hawkins, T., 67, 172
 Hejhal, D. A., xviii
 Helgason, S., xxiii, 72
 Helmholtz, H., 281, 287, 351, 365, 377,
 378, 385
 Henneaux, M., 378
 Hereman, W., 174
 Hermann, R., 39, 40, 68, 71
 Hilbert, D., 258, 281, 282
 Hill, E. L., 282
 Hirsch, A., 378, 386
 Hojman, S., 463
 Holm, D. D., viii, x, 173, 281, 462
 Holmes, P. J., 428
 Homsy, G. M., 378, 384
 Horndeski, G. W., 386
 Hughes, T. J. R., 464
- Ibragimov, N. H., xxiii, 177, 182, 328,
 375, 376, 380, 384, 462, 464, 465
 Ince, E. L., 172, 173, 195
 Infeld, L., 464
- Jacobi, C. G. J., 172, 282, 428
 Jacobson, N., 68, 71
 Johnson, H. H., 375
 Jost, R., 427
- Kahn, D. W., 172, 176
 Kalnins, E. G., 174, 179, 237, 375, 376,
 379
 Kamke, E., 172
 Kamran, N., viii, 376
 Kapitanskii, L. V., 198, 236
 Kersten, P. H. M., 175

- Khamitova, R. S., 377
 Khesin, B. A., 464
 Kibble, T. W. B., 377
 Kirillov, A. A., 427
 Klein, F., 282
 Knops, R. J., 277, 281
 Knowles, J. K., 282
 Kodama, Y., 236
 Konopelchenko, B. G., 376
 Kosmann-Schwarzbach, Y., ix, 375, 462, 463
 Kostant, B., 427
 Kostin, V. M., 236
 Kovalevskaya, S., 175, 299, 376
 Kozlov, V. V., 428, 429
 Krasilshchik, I. S., 376
 Krause, J., 173
 Kruskal, M. D., 238, 376, 379
 Kumei, S., vii, xxiii, 173, 174, 238, 328, 375, 376, 380, 383
 Kupershmidt, B. A., 378, 462, 463, 465
 Kuznetsov, E. A., 462

 Lax, P. D., 281, 311, 377, 462
 Lee, Y. C., 376
 Lenard, A., 376, 453
 Leo, M., 381, 465, 466
 Leo, R. A., 381, 465, 466
 Levi, D., xxiii, 238
 Lewis, D., 462
 Lewy, H., 160, 176
 Li, Y.-S., 376
 Lichnerowicz, A., 427, 432, 463
 Lie, S., xvii, xviii, xxiii, 52, 67, 68, 75, 130, 131, 172–175, 178, 180, 235–237, 282, 286, 306, 375, 427
 Lin, J.-E., 376
 Liouville, R., 427
 Lipkin, D. M., 377
 Lisle, I., 178
 Lloyd, S. P., 177
 Logan, J. D., 282, 284

 McLeod, J. B., 237, 238
 Maddocks, J. H., viii
 Maeda, S., xxiii
 Magri, F., 462, 463, 465
 Manakov, S. V., 428
 Mancarella, G., 381, 465, 466
 Manin, Yu. I., 462
 Markus, L., 173, 180
 Marsden, J. E., viii, xxi, 68, 281, 427–429, 462, 464

 Martini, R., 175
 Mayer, A., 172, 378
 Meyer, K. R., 428
 Michal, A. D., 236
 Michel, L., 173
 Mikhailov, A. V., 453
 Miller, K. J., 281
 Miller, W., Jr., ix, xxii, xxiii, 67, 174, 177, 179, 237, 306, 375, 376, 379
 Milnor, J. W., 172
 Mishchenko, A. S., 428, 429
 Miura, R. M., 195, 376, 379, 380, 465
 Montgomery, R., 462
 Moon, P., 41
 Morawetz, C. S., 281, 282
 Morgan, A. J. A., 236
 Morgan, T. A., 377
 Mukunda, N., 427

 Na, T. Y., xxiii, 174, 175, 236
 Nagano, T., 70
 Narasimhan, R., 68, 172
 Newell, A., 127, 311, 462
 Nikitin, A. G., 178, 375
 Nirenberg, L., 160, 176
 Noether, E., xviii, xx, 76, 173, 242, 272, 281, 282, 286, 328, 374, 375, 383
 Novikov, S. A., 427, 463, 466
 Nucci, M. C., 238
 Nutku, Y., 463, 466

 Oevel, W., 376
 Olver, P. J., xxiii, 174–178, 237–241, 282, 283, 375–380, 385, 387, 462–464, 466
 Ondich, J. R., 237
 Ostrogradski, M., 427
 Ovsiannikov, L. V., xviii, 173, 174, 178, 206, 236–238

 Palais, R. S., 68, 211, 213, 237
 Patera, J., 237
 Petrovskii, I. G., 175
 Pfaff, J. F., 172
 Pohjanpelto, P. J., 178, 283, 382
 Poincaré, H., 68, 69
 Poisson, S. D., 427
 Pommaret, J. F., 67, 175
 Pontryagin, L. S., 67, 68
 Posluszny, J., 175
 Prandtl, L., 236
 Pucci, P., 277

- Ramakrishnan, V., xxiii
 Ramani, A., 237
 Ratiu, T., 74, 281, 377, 462
 Riquier, Ch., 175, 176
 Ritt, J. F., 176, 180
 Rosen, G., 177, 236
 Rosenau, P., x, 174, 237, 240, 241, 284
 Rosencrans, S. I., 174, 431
 Rubel, L. A., 175
- Sattinger, D. H., ix, xxiii
 Santini, P., 376
 Schaettler, H., xxiii
 Schmidt, R., 377
 Schouen, J. A., 69, 432, 463
 Schreier, O., 67
 Schütz, J. R., 282, 283
 Schwarz, F., 174
 Schwarzmeier, J. L., 174
 Sedov, L. I., 236
 Segur, H., 237
 Semenov-Tian-Shanskii, M. A., 463
 Serre, D., 464
 Serrin, J., 277
 Seshadri, R., xxiii, 174, 175, 236
 Shabat, A. B., vii, viii, 325, 328, 348, 376, 377
 Shakiban, C., x, 378, 385
 Shapovalov, A. V., 307, 376
 Shirokov, I. V., 307, 376
 Shokin, Yu. I., xxiii
 Shtelen, W. M., 376
 Skan, S. W., 236
 Smale, S., 428
 Sokolov, V. V., 241, 325, 328, 376, 377
 Soliani, G., 381, 465, 466
 Solombrino, L., 381, 465, 466
 Souriau, J.-M., 427, 428
 Spencer, D. C., 175
 Spencer, D. E., 41
 Stegun, I., 192, 208
 Steinberg, S., 174, 382
 Stephani, H., vii
 Sternberg, E., 282
 Steudel, H., 281, 375, 377, 384
 Strauss, W. A., 281, 283
 Struik, D. J., 69
 Stuart, C. A., 277, 281
 Sudarshan, E. C. G., 427
 Sussmann, H. J., 68
 Svinolupov, S. I., 241
- Tabor, M., 237
 Takens, F., 378, 379
- Tavel, M. A., 283, 383
 Taylor, G. I., 238
 Taylor, M., 377
 Thirring, W. E., 67, 335
 Thompson, G., 378, 386
 Tiknonov, A. N., 299
 Toda, M., 429
 Tsujishita, T., 378
 Tu, G.-Z., 376, 379
 Tu, L. W., 59, 69
 Tulczjew, W. M., 378
- Vainberg, M. M., 378
 van der Schaft, A. J., xxiii
 van der Vorst, R. C. A. M., 277
 Vessiot, E., 173
 Vilenkin, N. J., xxiii
 Vinogradov, A. M., 175, 176, 237, 243, 282, 376–378, 462, 463
 Vladimirov, V. S., 376
 Volovich, I. V., 376
 Volterra, V., 378
- Wahlquist, H. D., xxi
 Warner, F. W., 32, 47, 59, 67–70, 72
 Weierstrass, K., 281
 Weinstein, A., xxi, 68, 74, 281, 427–429, 462
 Weisner, L., 237
 Weiss, J., 237
 Weyl, H., 67
 Whitham, G. B., 174, 179, 281, 465, 466
 Whitney, H., 172
 Whittaker, E. T., 283, 416, 427–430
 Widder, D. V., 192
 Wilczynski, E. J., 68
 Williams, G. C., 375
 Willis, J. R., 281
 Wilson, G., 377, 382, 463
 Winternitz, P., xxiii, 174, 237, 238, 376, 379
 Wolf, K. B., 382
 Wulfman, C. E., 375
 Wussing, H., 172
- Yamilov, R. I., 348, 377
 Yortsos, Y. C., 179, 381
- Zabusky, N. J., 379
 Zakharov, V. E., 376, 462
 Zassenhaus, H., 237
 Zharinov, V., vii

Subject Index

- abelian, 14, 259, 285, 422, 425
- adjoint, 314, 465
- adjoint equation, 382
- adjoint representation, 199, 237, 432
 - orbits, 203
- Ado's theorem, 47, 68
- affine, 52
- Airy function, 209
- Airy's equation, 208
- algebra, 288, 357, 434
 - computer, vii, 174
 - heat, 118, 122, 204
- angular momentum, 275, 280, 398, 411,
 - 420, 426, 429, 451
- anti-derivation, 57, 353
- approximate symmetry, 376
- area integral, 450
- asymptotics, 236
- atlas, 6
- atomic explosion, 238

- Bäcklund's theorem, 376
- Bäcklund transformation, 175
- basis, 3
 - dual, 54, 397, 421
- BBM equation, 238, 283
- Betti reciprocal theorem, 338
- bicomplex, 353, 378
- bifurcation theory, xxiii
- biHamiltonian system, 453, 455, 463,
 - 466

- biharmonic equation, 177
- bi-vector, 432, 441, 454
- Boltzmann's problem, 238
- boundary, 66, 243, 263, 333
- boundary layer, 236
- boundary value problem, xxiii, 159
- Boussinesq equation, 382, 460, 465
- Boussinesq equations, 465
- bracket
 - Lie, 33, 43, 61, 115, 200, 257, 283, 301,
 - 309, 393, 447
 - Lie–Poisson, 396, 397, 427, 428, 462
 - Poisson, 390, 394, 409, 418, 427, 431,
 - 435, 446
 - Schouten, 432, 463
- bundle
 - cotangent, 54, 353, 399, 431
 - extended jet, 220, 237
 - Grassmann, 240
 - tangent, 25
- Burgers' equation, 121, 295, 302, 379,
 - 380, 381
 - conservation laws, 330
 - master symmetry, 317
 - recursion operator, 311, 315, 316

- calculus of variations, 243, 281, 378
- canonical conserved density, 348
- canonical coordinates, 405, 427
- canonical form, 360, 441
- Cartan form, 378

- Cartesian product, 5, 6, 16, 71, 95
- Casimir function, 391, 427
- Cauchy data, 162
- Cauchy–Kovalevskaya theorem, 162, 167, 175
- Cauchy problem, 159, 162, 165, 171, 297
- centre of mass, 279, 281, 283, 411, 429
- chain rule, 187
- change of coordinates, 6, 29, 56
- change of variables, 249, 310, 386
- characteristic, 303, 310, 323
 - equivalent, 266
 - of conservation law, 266, 272, 281, 330, 334, 339, 341
 - of vector field, 116, 229, 241, 272, 291, 301, 334, 435, 448
 - trivial, 266, 387
- characteristic class, 378
- characteristic direction, 164, 175
- characteristic equation, 196
- characteristic form, 266, 281
- characteristic system, 87, 132, 173, 196
- chart. *See* coordinate chart
- chemical exchange process, 179
- circle, 5
- closed, 57, 59, 352, 354, 362
- cnoidal wave, 194
- co-adjoint orbit, 407, 428
- co-adjoint representation, 406, 421, 427
- codifferential, 56
- commutator, 33, 35, 44, 200, 301, 320, 341, 346, 379
- commutator subgroup, 72
- commutator table, 50, 202
- completely integrable, 68, 236, 426, 428, 462
- complex, 58
 - D, 352
 - deRham, 58, 66, 69, 352
 - variational, 361, 363, 377
 - vertical, 354
- compressibility, 238
- computer algebra, vii, 174
- conformal group, 73, 124, 129, 256, 277, 283, 306
- conic, 260, 335
- conjugation, 176, 199, 200
- connected, 13, 17, 22, 39
- conservation
 - of angular momentum, 275, 280, 411, 451
 - of energy, 260, 263, 274, 280, 281, 411
 - of linear momentum, 263, 275, 280, 411
 - of mass, 263, 446
- conservation law, 261, 267, 269, 272, 330, 333, 347, 377, 378, 382, 408, 446, 447, 464
 - characteristic form, 281
 - characteristic of, 266
 - equivalent, 265, 267
 - formal, 349
 - linear, 337
 - nonlocal, 376
 - quadratic, 338
 - strong, 281
 - trivial, 265, 281, 345, 384, 387
 - trivial first kind, 264
 - trivial second kind, 264, 281
- conserved density, 261, 349, 382, 447
 - canonical, 348
- constant
 - of the motion, 261
 - structure, 50, 68, 396, 418, 421
- contact
 - n -th order, 219, 223, 226
- contact transformation, xxiii, 236, 328, 375
- continuity equation, 263
- control theory, xxiii
- coordinate chart, 3, 6, 211, 222
 - flat, 11, 30, 41, 211, 226
 - oriented, 66
- coordinates
 - canonical, 405, 427
 - change of, 6, 29, 56
 - cylindrical, 197, 406, 425
 - distinguished, 402, 405
 - flat, 11, 30, 41, 86, 211, 217, 226, 230, 402
 - homogeneous, 222
 - Lagrangian, 462
 - local, 3, 6, 228
 - normal, 72
 - polar, 105, 135, 426
 - spherical, 403
 - toroidal, 41
- cotangent bundle, 54, 353, 399, 431
- cotangent space, 54, 353, 399, 431
- covering, 13, 19
- crack, 275, 281
- critical point, 246
- critical value, 172
- cross product, 71, 397, 422
- curl, 58, 59, 74
 - total, 265, 374, 464
- curvature, 113, 142, 221
- curve, 9, 12, 24, 221, 244, 247
 - closed, 13, 69

- integral, 26
- cuspidal, 9
- cylindrical coordinates, 197
- Darboux' theorem, 405, 412, 415, 427, 462
- de Rham complex, 58, 66, 69, 352
- deformation, 275
- density
 - conserved, 261, 348, 349, 382, 447
 - fluid, 127, 215, 216, 238, 263
- dependent variables, 90, 189, 217, 220, 231, 243, 288
- derivation, 31, 61, 308, 355, 392, 443
 - anti-, 57, 353
- derivative
 - exterior, 57
 - Fréchet, 307, 322, 329, 332, 344, 364, 385, 437
 - Lie, 60, 69, 74, 200, 308, 310, 355, 369, 381, 388, 431, 437, 440, 442
 - normal, 165
 - partial, 95, 109, 288
 - Schwarzian, 146
 - total, 109, 245, 289, 300, 319, 355, 368, 440
 - variational, 245, 359, 363, 385, 434
- determining equations, 116, 131
- diffeomorphism, 2
- difference equation, xxiii
- differential, 32, 37, 54, 57, 61, 398
 - total, 351, 369
 - variational, 361
 - vertical, 353, 355
- differential equation, 96, 222
 - linear, 174, 178, 179, 306, 336, 339, 341, 376
 - ordinary, 131, 172, 183, 292
 - prolonged, 166, 170
- differential form, 53, 68, 175, 351, 430
 - closed, 59, 352, 354, 362
 - exact, 59, 352, 354, 362
 - symplectic, 430
- differential function, 288, 299, 322, 355, 356, 434
- differential invariant, 139, 141, 142, 181
- differential operator, 168, 174, 182, 306, 308, 310, 318, 328, 336, 343, 361, 384, 435, 436, 442, 465
 - adjoint, 328
 - degenerate, 454
 - invariant, xxiii
 - matrix, 455
 - pseudo-, 312, 319, 324, 346, 377, 381, 382, 462, 465, 466
 - self-adjoint, 329, 332, 336, 364, 384, 385, 465
 - skew-adjoint, 329, 339, 361, 384, 385, 436, 438, 445, 465
- differential system, 68
- diffusion, 117, 179, 238
- diffusion equation, 380
- dilatation, 52, 124, 256, 280, 306, 340
- dimensional analysis, 214, 236
- direct method, 237
- direction
 - characteristic, 164, 175
 - non-characteristic, 164, 168
- Dirichlet's principle, 247
- discrete symmetry, xviii, 17, 204
- dislocation, 281
- displacement, 338
- dissipation, 121
- distinguished function, 391, 392, 409, 427, 428
- distinguished functional, 410, 446
- distribution, 68
- divergence, 58, 59, 74, 254, 373
 - n -th order, 368, 387
 - null, 265, 352, 374
 - total, 248, 254, 271, 289, 352, 356, 434, 464
- divergence identity, 277
- divergence symmetry, 278, 282, 331, 377, 383
- divergence theorem, 66, 245, 248, 262
- dual basis, 54, 397, 421
- dual space, 54, 396, 406, 440
- duBois–Reymond lemma, 343
- eccentricity, 335
- elasticity, 165, 178, 236, 275, 281, 282, 338, 375, 464
- elliptic equation, 175
- elliptic function, 193, 208, 415, 416
- Emden–Fowler equation, 284
- energy, 263, 274, 281, 411, 444, 464
 - internal, 263
 - moment, 280
 - release rate, 276
 - stored, 275, 338, 464
- energy-momentum tensor, 276, 282
- entropy, 263, 281
- equation
 - adjoint, 382
 - Airy, 208

- equation (*cont.*)
 BBM, 238, 283
 biharmonic, 177
 Boussinesq, 382, 460, 465
 Burgers'. *See* Burgers' equation
 characteristic, 196
 determining, 116, 131
 difference, xxiii
 differential, 96, 222
 diffusion, 380
 Emden–Fowler, 284
 Euler. *See* Euler equations
 Euler–Lagrange. *See* Euler–Lagrange equations
 evolution. *See* evolution equation
 exact, 135
 Fokker–Planck, 177, 381, 382
 Hamilton, 392, 395, 397, 430
 Hamilton–Jacobi, xxii, 430
 Harry Dym, 381, 465
 heat. *See* heat equation
 Helmholtz, xxii, 177, 382
 homogeneous, 133
 hyperbolic, 236, 281
 integro-differential, 376
 Korteweg–de Vries. *See* Korteweg–de Vries equation
 Laplace. *See* Laplace's equation
 Maxwell, 173, 178, 283, 382, 464
 modified Korteweg–de Vries, 380, 465
 Navier, 165, 171, 178, 283, 338
 Navier–Stokes, 177
 Newton, 274
 nonlinear diffusion, 117, 179, 238
 nonlinear heat, 178, 380
 nonlinear wave, 177, 222, 293
 reduced, 258
 Riccati, 139, 144, 146, 156
 Schrödinger, 379
 sine-Gordon, 336, 380, 383
 telegraph, 177, 381
 Thomas, 179
 Toda, 428, 429, 463, 465, 466
 vorticity, 444, 464
 wave. *See* wave equation
 Weber, 192
 equivalent, 210, 292, 356, 365, 378
 n -th order, 219, 223
 error function, 157, 192
 Euclidean group, 71, 73, 239, 276, 428, 429
 Euclidean metric, 73
 Euclidean space, 4, 67

 Euler equations
 conservation laws, 450, 464
 fluid, 127
 group-invariant solutions, 195, 238
 Hamiltonian structure, 444, 462, 464
 rigid body, 398, 416
 symmetries, 127, 174, 177
 Euler–Lagrange equations, 246, 336, 430, 464
 abnormal, 343, 377
 conservation laws, 272, 334, 377
 equivalent, 365, 378
 inverse problem, 363, 377, 386
 symmetries, 255, 278, 332, 377
 Euler operator, 246, 250, 289, 329, 332, 353, 363, 365, 386
 higher, 365, 368, 369, 379
 evolution equation, 297, 303, 376, 379, 380, 382, 434
 conservation law, 447
 Hamiltonian, 436
 integrable, 325, 328
 related, 179
 evolutionary representative, 291, 331
 evolutionary vector field, 291, 300, 303, 307, 354, 355, 358, 388, 435, 439
 exact, 59, 352, 354, 362
 exact equation, 135
 exponential, 29, 48, 72, 202
 exponential vector field, 181
 exponentiation, 28
 extended jet bundle, 220, 237
 exterior derivative, 57
 extremal, 243, 246

 factorial, 366
 field theory, 375, 377
 finitely generated, 40
 first integral, 257, 261, 284, 408, 410, 412, 418, 428, 430
 flat coordinates, 11, 30, 41, 86, 211, 217, 226, 230, 402
 flow, 27, 60, 68, 239, 254, 311, 380
 commuting, 36, 304
 Hamiltonian, 401, 436
 irrational, 24, 46, 70
 isentropic, 262, 263
 porous media, 179
 fluid, 26, 68, 127, 195, 215, 216, 218, 236, 238, 262, 281, 444, 462
 flux, 261, 263, 281
 Fokker–Planck equation, 177, 381, 382