

Index

- abscissa
 - absolute conv., 862
 - conditional conv., 862
- abscissa of absolute convergence, 405
- accelerator mode, 418
- action, 357, 624, 637, 646
 - helium, 696
 - relation to period, 704
- adjacency matrix, 287, 316, *see* transition matrix
- admissible
 - periodic points, 303
 - sequence, 261
 - trajectories, number of, 300
- Airy
 - equation, 629
 - function, 629, 630, 632, 685, 686, 688, 693
 - at a bifurcation, 632
 - integral, 629
- algebra, 769
 - associative, 769
 - Lie, 769
- allowable itinerary, *see* admissible
- alphabet, 221
- alternating binary tree, 236
- analyticity
 - domain, 373
- anomalous diffusion, 423
- Anosov flows, 263
- anti-hermitian
 - generator, 193, 195
- antiharmonic extension, 825
- arc, 289
- area preserving
 - Hénon map, 134
 - map, 816
- Artin-Mazur zeta function, 307
- associative algebra, 769
- atlas, 260
- attractor
 - basin, 37
 - Hénon, 117
 - strange, 37, 53, 108
- Aubry-Mather theory, 611
- autonomous flow, 40
- average
 - chaotic, 522
 - space, 331, 344
 - time, 332, 343
- averaging, 27
- axiom A, 406, 501, 506, 508, 789
- baker's map, 147, 252
- Balmer spectrum, 615
- basin of attraction, 37
- basis vector, 768
- BER
 - approximation, 534
- Bernoulli, 736
 - polynomials, 489
 - shift, 239, 421, 484, 489, 497, 507, 509, 514, 532, 739, 741, 887
 - shift eigenfunctions, 503
 - shift return times, 532
- Berry-Keating conjecture, 755
- Bessel function, 677
 - addition theorem, 679
- bi-infinite itinerary, 233
- bifurcation
 - Airy function approximation, 632
 - bizarre, 824
 - generic, 147
 - Hopf, 561
 - saddle-node, 68
- billiard, 142–147
 - map, 143
 - stability, 106, 144
 - stadium, 142, 148, 170, 535, 815, 817, 872
- binary
 - prime cycles, 257, 266, 316
 - symbolic dynamics
 - collinear helium, 699
 - tree, alternating, 236
- Birkhoff
 - coordinates, 143, 148, 268
 - ergodic theorem, 332
- block
 - finite sequence, 233
- block, pruned, 235
- Bohr

- helium, 695, 705
- Uetli Schwur, 751
- Bohr-de Broglie picture, 615
- Bohr-Sommerfeld quantization, 615, 631, 660, 752
- Boltzmann
 - equation, 23, 424
 - stosszahlansatz, 23
- Boltzmann, L., 23, 738
- boredom, 733, 867
- Borges, J.L., 733
- Botox, 59
- boundary orbits, 444
- bounded operators, 912
- Bourbaki, N., 72
- Bowen, R., 29
- brain, rat, 3, 30
- branch cut, 518
 - singularity, 519
- Brownian noise, 584
- Bunimovich
 - stadium, *see* stadium billiard
- Burnett coefficient, 429
- Burnett coefficients, 24, 420, 425
- butterfly effect, 30
- $C_{3v} = D_3$ symmetry, 268, 446
- canonical transformation, 131, 132, 779
- Cartan
 - Killing classification, 131
- Cartan, É., 213
- Cartwright, M.L., 170, 740
- Cauchy criterion, 911
- Cauchy-Green strain tensor, 110
- caustic, 640
- ceiling function, 369, 507
- center, 89
- center manifold, 554
- center of mass, 126
- central moment, 347
- centralizer, 155, 180
- chain rule, matrix, 909
- chain-recurrent, 38
- change
 - of coordinates, 42
- chaology, *see* chaos
- chaos, 6, 7
 - caveats, 9
 - deterministic, 29
 - diagnostics, 50
 - quantum, 29
 - skeleton of, 11, 13
 - spatiotemporal, 44, 538
 - successes, 9
- Character
 - tables, 797
- character, 463, 471
 - orthonormality, 463
 - representation, 797
- character table
 - dihedral group, 453
- characteristic
 - equation, 773
 - exponent, 111
 - function, 325
 - polynomial, 305, 774, 799
 - value, 111
- chart, 35, 260
- section border, 62
- chicken heart palpitations, 6
- circle group, *see* SO(2)
- circle map, 239, 289, 321, 428, 431, 561, 562, 567, 574, 577, 731, 852, 854, 884
 - critical, 563, 569
- class, 153
- class algebra, 469
- Clebsch-Gordan
 - coefficients, 770
 - series, 463
- closed orbit, 105, *see* periodic orbit
- co-moving frame, 100
- coarse-graining, 325
- cocycle, 87
- coding, *see* symbolic dynamics
- collinear helium, 617
 - symbolic dynamics, 699
- combinatorics
 - teaching, 228
- compact
 - group, 169
 - invariant set, 154
- complete
 - N -ary dynamics, 294
 - symbolic dynamics, 294
- completeness relation, 265, 770, 775, 800
- complex
 - Ginzburg Landau equation, 197
- complex eigenvalues, 782
- complexity
 - algorithmic, 314, 408
- computational degrees of freedom, 46
- confession
 - C.N. Yang, 331
 - Kepler, 736
 - St. Augustine, 325
- configuration space, 44, 50
- conjugacy, 757
 - invariant, 102

- smooth, 42, 102, 766
- topological, 229
- conjugate momentum, 128
- conjugate, hermitian, 795
- connection formulas, 629
- connection, method of, 213
- conservation
 - equation, 581
 - phase-space volume, 130, 133, 134, 137, 335
- continuity equation, 334, 335, 581, 586, 638
- contour integral, 377
- contracting
 - Floquet multipliers, 98, 362
 - flow, 37, 53, 84
 - map, 94, 242
 - state space, Rössler, 94, 413
- convergence
 - abscissa of, 862
 - abscissa of absolute, 405
 - abscissa of abysimal, 405
 - mediocre, 858
 - radius, 373
 - super-exponential, 494, 599
- convexity, 356
- coordinate
 - change, 42, 757
 - longitudinal, 647
 - transformations, 766
- Copenhagen School, iii, 752
- correlation
 - decay
 - power law, 513
 - function, 503
 - spectrum, 503
 - time, 479
- coset, 153
- cost function, 600
- counter-clockwise rotation, 192
- covariant Lyapunov vector, 113–115
- covariant vector, 96, 113, 776
- covering
 - symbolic dynamics, 233
- creeping
 - 1-disk, 687
- critical
 - point, 106, 227, 229, *see* equilibrium point
 - value, 227, 428
- cross-section, 201, 213
- cumulant, 347, 409
 - expansion, 304, 306, 395
 - Plemelj-Smithies, 916
- cumulant-generating function, 347
- curvature
 - correction, 391
 - expansion, 27, 392
- cycle, 105, *see* periodic orbit
 - expansion, 18, 391, 659
 - 3-disk, 412
 - finite subshift, 402
 - Lyapunov exponent, 402
 - stability ordered, 403
 - fundamental, 305, 391, 856
 - limit, 38, 98, 105, 108
 - Lyapunov exponent, 111
 - marginal stability, 101, 188, 466
 - prime, 119, 233, 272, 321, 363
 - 3-disk, 281, 609
 - Hénon map, 602
- pruning, 320
- Rössler flow, 124, 126, 283
- stability, 95–104
 - Gauss map, 571
 - stable, 106
 - superstable, 106
 - weight, 375
- cycle point, *see* periodic point
- cyclic
 - group, 158
 - invariance, 119, 272
 - permutation matrix, 803
 - symmetry, 316
- damped Newton method, 121
- Danish pastry, *see* symbol plane
- Darboux basis, 130, 140
- de Broglie wavelength, 633
- Debye approximation, 693
- decay
 - rate, 380
 - rate of correlations, 504
- decomposition
 - irreducible, 801
- defining
 - representation, 795
 - vector space, 794
- deformation gradient, 87
- degenerate
 - eigenvalues, 772
- degree of freedom, 9, 128, 555, 625
- degrees of freedom
 - computational, 46
- delta function, *see* Dirac delta
- Dirac, 621
- density, 325, 581
 - evolution, 23
 - phase space, 335

- density of states
 - average, 656
 - Green's function, 621
 - quantum, 621
- derivative cocycle, 87
- derivative, lattice, 802
- desymmetrization
 - 3-disk, 457
- desymmetrized state space, 201
- determinant
 - for flows, 374
 - Fredholm, 919
 - graph, 315
 - Hadamard, 373
 - spectral, 22, 304, 373
 - trace relation, 304
 - trace-class operator, 913
- deterministic dynamics, 6, 34, 333
- diagonalizing matrix, 799
- diffeomorphism, 67
- differential equations
 - almost ordinary, 55
- diffraction
 - Green's function, 719
 - Keller, 726
 - Sommerfeld, 726
- diffusion
 - anisotropic, 582
 - anomalous, 423
 - constant, 357
 - equation, 582, 583
 - limited aggregates, 30
 - tensor, 582
- digraph, *see* directed graph
- dihedral group, 158
- dike map, 231, 242
- dimension
 - box counting, 869
 - fractal, 869
 - generalized, 9
 - information, 869, 870
 - intrinsic, 9, 555
 - symplectic, 139
- Dirac delta, 20, 22, 307, 327, 340, 348, 349, 363, 370, 381, 497, 583, 622, 642, 652
 - derivatives, 340
 - Jacobian, 334
- Dirac path integral, 651
- Dirichlet
 - series, 861
- Dirichlet series, 409, 855, 862
- discrete
 - Fourier transform, 806
- dissipation
 - rate, Kuramoto-Sivashinsky, 559
 - rate, Navier-Stokes, 559
- dissipative
 - map, 94, 242
- divergence rate, local, 358
- divergence ultraviolet, 657
- DLA, 30
- dof, *see* degree of freedom
- dot product, 182
- doubling map, 239, 500
- drift, along group tangent, 179
- dual
 - representation, 768, 794, 795
 - space, 768, 794
 - vector space, 794
- Duffing oscillator, 50, 52, 69, 129
- dynamical
 - localization, quantum, 140
 - transitivity, 287
 - zeta function, 17, 376
 - Euler product rep., 376
- dynamical system, 33, 35
 - axiom A, 406, 506, 789
 - equivalent, 765
 - gradient, 55
 - hyperbolic, 385, 500
 - infinite, 559
 - smooth, 18, 19, 27, 35, 310, 740, 887, 890, 891
- dynamics, 34
 - deterministic, 6, 34
 - hyperbolic, 295
 - irreversible, 39
 - reversible, 39
 - spatiotemporal, 29
 - stochastic, 6
 - symbolic, 11, 220, 232
 - symmetry, 152, 178, 199, 465
 - topological, 220, 232, 234, 288
- edge, 289
- eigendirection, 78
- eigenfunction
 - Perron-Frobenius operator, 487
 - energy, 619
 - Perron-Frobenius, 487
- eigenstate, *see* eigenfunction
- eigenvalue, 380
 - Perron-Frobenius operator, 487
 - complex, 782
 - degenerate, 772
 - exponential spacing, 384
 - zero, 630, 645
- Einstein diffusion formula, 583, 594

- Einstein, A, 755
 elastic
 scattering, 664
 elliptic
 stability, 135
 empirical mean, 347
 enemy
 thy, 513
 energy
 Kuramoto-Sivashinsky, 559
 Navier-Stokes, 559
 English
 plain, 190, 233
 ensemble
 microcanonical, 358
 entire function, 487
 entropy
 barrier, 405, 744, 862
 Gauss map, 578
 Kolmogorov, 147, 315, 864, 866, 871, 872
 topological, 7, 300, 308, 315
 equations of variations, 76
 equilibrium, 184
 Kuramoto-Sivashinsky, 558
 Lorenz flow, 52, 70
 point, 40, 96, 330, 551, 604
 Rössler flow, 53, 55, 90, 238
 relative, 184
 equilibrium measure, *see* natural measure
 equivalence
 of dynamical systems, 765
 equivariance, 152
 two-mode flow, 195
 equivariant, *see* relative state space, 202
 ergodic
 average, 332
 theorem
 multiplicative, 114
 theory, 332
 error correlation matrix, 111, 591
 error matrix, 87
 escape rate, 13, 14, 340, 353, 358, 359, 378, 379, 397, 402, 409, 412, 473, 477, 490, 509, 586, 791, 855, 866, 870, 871, 922
 3-disk, 401, 412, 475
 intermittency, 521
 vanishing, 341, 401, 821
 essential
 spectral radius, 496, 505
 spectrum, 496
 Euler
 formula, 80, 489
 limit, 81
 -MacLaurin formula, 504
 product, 81, 379
 product rep.
 dynamical zeta function, 376
 totient function, 565
 Eulerian coordinates, 41, 59, 77, 466
 evolution
 group, 55
 kernel probabilistic, 333
 operator, 20, 349
 quantum, 620
 semigroup, 350
 evolution operator, 87
 expanding
 Floquet multipliers, 98, 362
 expectation, 347
 expectation value, 345, 359
 expected value, 347
 exponent
 Floquet, 98
 exponential
 convergence, 373, 494
 decay rate of correlations, 504
 generating function, 343, 347, 489
 of a matrix, 80
 proliferation, 21, 314, 408
 external node, 290
 extremal point, 626
 factor group, 154
 false zeros, 379
 Farey
 map, 223, 512, 515, 534
 mediant, 566
 series, 564
 tree, 566
 Feigenbaum
 constant, 370
 Feynman path integral, 644, 651
 fiber, 39
 fiber bundle, 39
 Fick law, 582
 finite group, 158
 finite subshift
 cycle expansion, 402
 first return time, 59, 261, 531
 fixed point, 119, 272
 maps, 73
 marginally stable, 512
 subspace, 155, 180
 under G , 155, 162, 163, 180
 Floquet

- exponent, 85, 98, 133
- multiplier, 98, 244, 362, 776
- multiplier, metric invariant, 102
- theorem, 777
- theory, 98, 105
- vector, 96
- flow, 33–48
 - invariant set, 95
 - autonomous, 40
 - contracting, 37, 53, 84
 - deterministic, 333
 - elliptic, 99
 - generator of, 334, 465, 840
 - Hamiltonian, 128, 816
 - hyperbolic, 99, 135, 380
 - incompressible, 85, 335
 - infinite-dimensional, 45, 537–555, 558
 - invariant subspace, 155
 - inverse hyperbolic, 135
 - linear, 79, 86
 - linearized, 87
 - map, 36
 - nonhyperbolic, 99
 - spectral determinant, 374
 - stability, 81
 - stationary, 40
 - stochastic, 333
 - stretch & fold, 230, 240
 - symplectic, 99
- flow map, 50
- flows, 67
- Fokker-Planck equation, 586
- form, normal, 763
- Fourier mode, truncation, 45, 541
- Fourier transform, discrete, 806
- Fréchet derivative, 87
- fractal, 30, 867
 - aggregates, 10
 - dimension, 95, 869
 - geometry of nature, 10
 - probabilistic, 10
 - science, 9
- Fredholm
 - determinant, 919
 - theory, 494
- free energy, 348
- free node, *see* external node
- freezing, 201
- Frenkel-Kontorova model, 611
- frequency
 - analysis, 50
 - visitation, 331
- Fresnel integral, 596, 626, 632
- full shift, 294
- function, 67
 - L^2 square-integrable, 505
 - analytic, 504
 - space, piecewise constant, 371
- functional, 332
 - composition, 38
 - Lyapunov, 37
- fundamental
 - cycle, 305
 - cycles, 856
 - domain, 155, 258
 - collinear helium, 698
 - matrix, 87, 771, 843
- G -equivariant, 180
- G -fixed, 155, 162, 163, 180
- G -invariant
 - basis, *see* invariant polynomial basis
 - polynomial basis, 169, 209
- G -invariant
 - polynomial basis, 170, 175, 176, 213
- G_p -symmetric, 162
- Gälerkin truncation, 46, 548
- Galilean invariance, 538, 559, 560
- Gatto Nero, professor, 439
- gauge
 - fixing, 260
 - invariance, 260
- gauge fixing, 63
- Gauss map, 341, 534, 565, 575
 - cycle stability, 571
 - metric entropy, 578
- Gauss shift, *see* Gauss map
- Gaussian
 - integral, 340, 420, 596, 652
 - integral, d -dimensional, 596, 642
 - noise, 895
 - probability density, 591
- general linear group, 151
- generalized
 - period, 469
 - periodic orbit, 469
- generating
 - function, 16, 303, 350, 364, 428, 569, 611, 831, 852, 881
 - function, exponential, 343, 347, 489
 - orbit, 236
 - partition, 234
- generator
 - anti-hermitian, 193, 195
 - Lie algebra, 131, 182
 - of flow, 334, 465, 840
- Gilmore, R., 170

- Ginzburg Landau equation, complex, 197
 $GL(d)$
 general linear group, 151
 $GL(n, \mathbb{F})$, 793
 golden mean, 289, 321
 pruning, 242, 295, 317, 321, 387,
 822, 853
 renormalization, 567, 575
 good taste, 236
 gradient
 algorithm, 600
 system, 55
 grammar
 symbolic dynamics, 234
 graph
 irreducible, 289
 root, 290
 rooted tree, 290
 strongly connected, 289
 transition, 286
 tree, 290
 Gray codes, 236
 Green's function, 622
 analogue of, 844
 density of states, 621
 diffraction, 719
 energy dependent, 621
 regularized, 658
 scattering, 669
 semiclassical, 649, 651, 652
 short distance, 648, 649
 trace, 621
 long orbits, 648
 Greene's residue criterion, 135
 group, 792
 compact, 169
 cyclic, 158
 dihedral, 158
 dynamical, 39
 evolution, 55
 finite, 149, 158
 general linear, 793
 integral, 461–463
 integration, 464
 Lie, 131, 181
 matrix, 151
 not a, 818
 orbit, 154, 169, 180, 184
 orbit, marginal eigenvalue, 188
 orbit, slice, 202, 204, 210
 orbit, velocity, 777
 order of, 150, 793
 representation, 150, 464, 796
 semi-, 327, 840
 symmetric, 158
 symmetry, reduction, 201
 tangent field, 182, 183
 Gutzwiller
 path integral, 651
 trace formula, 615, 656
 Gutzwiller, M., 743
 Haar measure, 464, 471, 473
 Hadamard determinant, 373
 Hadamard product, 658
 Hamilton
 -Cayley theorem, 770, 775
 -Jacobi equation, 592, 634, 649, 902
 equations, 634
 principal function, 592, 637
 Hamiltonian, 635
 dynamics, 127–137
 equations, 128
 flow, 128, 816
 spectral determinant, 384
 stability, 132, 781
 flows, stability, 778
 Hénon map, 134
 matrix, 131, 139
 repeller, periodic orbits, 126
 separable, 619
 Hankel function, 649, 677, 693
 Hankel singular values, 109
 Hannay-Ozorio de Almeida sum rule, 482
 harmonic oscillator, 766
 Harter, W. G., 469
 heat
 equation, 582, 583
 Heaviside function, 621
 Heisenberg, 752
 picture, 910
 Heisenberg, W., 752
 helium, 695, 752
 collinear, 56, 73, 129, 617, 714
 cycles, 283, 714
 eigenenergies, 714
 fundamental domain, 698
 Poincaré section, 714
 stabilities, 714
 stability, 126
 Helmholtz equation, 677
 Helmholtz free energy, 348
 Hénon map
 fixed points, 73
 Hénon map, 68, 71, 134
 attractor, 117, 339
 cycles, 126, 600
 fixed points, 266
 Hamiltonian, 134

- horseshoe, 266
- inverse, 266
- Lyapunov exponent, 117
- natural measure, 330
- prime cycles, 602, 612
- pruning, 858
- pruning front, 264
- stability, 93, 106
- structural stability, 270
- symmetries, 816
- time delay map, 282
- transient, 602
- Hénon, M., 68
- Hénon-Heiles
 - symbolic dynamics, 170
- hermitian
 - conjugation, 795
 - matrix, 795
- heroes
 - unsung, iii, viii
- Hessian matrix, 132
- heteroclinic
 - connection, 225, 234, 239, 748
 - intersection, 264
 - orbit, 50, 92, 141, 170, 225, 237, 262
- high-dimensional
 - state space, 43
- Hilbert
 - basis, *see* invariant polynomial basis
 - space, 619
- Hilbert-Schmidt
 - operators, 912
 - condition, 495
- Hilbert-Weyl theorem, 169
- Holmes, P., 555
- homoclinic
 - orbit, 52, 225
 - point, 737
 - tangency, 245, 256
 - tangle, 264, 574
- Hopf bifurcation, 561
- Hopf's last hope, 749
- Hopf, Ebehardt, 561, 748, 749
- Hopf, Heinz, 712
- horseshoe, 249
 - complete, 251
- hydrodynamical
 - interpretation of QM, 650
- hyperbolic
 - flow, 99, 135, 380
 - non-, 24
 - orbit, partially, 99
- systems, 344, 385, 397, 401, 415, 422, 477, 500, 507, 522, 616, 662, 746, 754, 867, 871, 906
- hyperbolicity assumption, 16, 363
- image space, 201, 210
- in
 - node, 89, 96
 - spiral, 89, 96
- in-degree, 290
- in/out nodes, 89
- inadmissible symbol sequence, 234
- incommensurate, 37
- incompressible flow, 85
- indecomposability, 287
 - metric, 221
- index
 - Maslov, *see* topological index
- index summation, repeated, 84, 132, 793
- indifferent stability, 78
- induced map, 525
- inertial manifold, 547, 555
- infinite-dimensional state space, 43
- infinite-dimensional flows, 45, 537–555, 558
- inflection point, 562
- information dimension, 869, 870
- initial
 - conditions, sensitivity to, 7
 - point x_0 , 15, 36, 76
 - state x_0 , 15, 36
- injective, 72
- integrable system, 129, 756
- integrated observable, 343, 344, 349, 358, 363, 377, 391, 856
- integration
 - by parts, lattice, 803
 - group, 464
 - Runge-Kutta, 55
- intermittency, 147, 341, 403, 404, 409, 423, 427, 499, 511, 616, 709, 871, 878
 - anomalous diffusion, 423
 - escape rate, 521
 - piecewise linear model, 514
 - resummation, 526
 - stability ordering, 529
- internal node, 290
- invariance
 - cyclic, 119, 272
 - Galilean, 538, 559
 - local Galilean, 560
 - of flows, 100
 - symplectic, 128, 138, 778
- invariant, 795

- density, *see* natural measure
 matrix, 795
 measure, 330
 measure, Gauss map, 341
 metric, 97, 102
 points, 155, 180, 439
 polynomial basis, 169, 170, 175, 176,
 201, 209–211, 213
 set, compact, 154
 subgroup, 154
 subspace, 155
 topological, 97
 tori, 189
 vector, 795
 inverse
 hyperbolic, 98, 135
 iteration, 119
 iteration, Hamiltonian repeller, 126
 inversion, 158
 involution, 158
 inward/outward spirals, 89
 irreducible
 decomposition, 801
 graph, 289
 matrix, 287
 representation, 438, 463
 segment, 166
 irrep, 438, 801
 cyclic group, 452
 irrep basis
 dihedral group, 454
 irreversibility, 23, 39
 Ising model, 268, 445, 458, 876, 878,
 888, 889, 894
 isotropy
 subgroup, 160, 162, 163, 169, 190
 isotypic decomposition, 156
 iteration, 35
 inverse, 119
 Hamiltonian repeller, 126
 map, 65
 itinerary, 11, 13, 221, 269, 281
 bi-infinite, 223, 233
 future, 227, 232
 past, 233
 Jacobi, C.G.J., 86
 Jacobian
 matrix, 15, 77, 87, 771
 jacobian, 84, 326
 Hénon map, 93
 Jonqui  re function, 424, 427, 431, 515,
 535
 Jordan normal form, 774
 KAM, 140
 tori, 511
 Kamiltonian, 132
 Kaplan-Yorke criterion, 99
 Karhunen-Lo  ve, 248
 Keller diffraction, 726
 Keller, J.B., 742
 Keplerian orbit, 615
 kernel
 resolving, 495
 kneading
 determinant, 236
 sequence, 230, 242
 theory, 230
 value, 230, 242
 Kolmogorov entropy, 147, 315, 864, 866,
 871, 872
 Koopman operator, 839, 843
 Kraichnan, Robert H., 749
 Kramers, 752
 Krein-Friedel-Lloyd formula, 671
 Kronecker delta, 768, 794
 KS, *see* Kustaanheimo-Stiefel
 Kuramoto, Y., 555
 Kuramoto-Sivashinsky
 equilibria, 558
 system, 553, 555–558
 kurtosis, 348, 359, 429
 Kustaanheimo-Stiefel transformation, 696,
 760
 L^2 function space, 505
 Lagrangian, 636
 coordinates, 41, 59, 77, 466
 frame, 100
 manifold, 638
 laminar states, 511
 Langevin equation, 585, 594
 Laplace
 transform, 22, 307, 352, 365, 366,
 372, 621, 649, 841
 transform, discrete, 303, 364, 532
 Laplace, Pierre-Simon de, 5
 Laplacian
 diagonalization, 819
 diagonalized, lattice, 809
 inverse, lattice, 804
 lattice, 803, 804
 non-local, 819
 last hope, Hopf's, 749
 lattice
 derivative, 802
 Fourier transform, 806
 integration by parts, 803
 Laplacian, 803, 804

- Laplacian, diagonalized, 809
- Laplacian, inverse, 804
- leaf, *see* external node
- least action principle, 281, 609
- Legendre transform, 637
- Leibniz, Gottfried Wilhelm, 5
- Letellier, C., 170
- level set, 128
- Liapunov, *see* Lyapunov
- libration orbit, 701, *see* self-retracing
- Lie
 - algebra, 131, 181, 182, 769
 - bracket, 183
 - derivative, 183
 - group, 131, 181
 - product, 769
- lifetime, 13
- matrix, 674
- limit cycle, 38, 98, 105, 108
- linear
 - cocycle, 87
 - flow, 79, 86
 - space, 767
 - stability, 75, 95, 551
- linearized
 - flow, 87
- link, 289
- Liouville
 - equation, 336
 - operator, 336
 - theorem, 130, 133, 134, 137, 335
- Liouville's formula, 84
- little group, 160, 162
- Littlewood, J.E., 740
- local
 - divergence rate, 358
 - stability, 75, 95, 551
- localization, quantum dynamical, 140
- logistic map, *see* unimodal
- longitudinal
 - coordinate, 647
- loop
 - intersecting, 305
- Lorentz gas, 409, 415, 425, 426, 433, 511
- Lorentzian, 622
- Lorenz flow, 52, 70, 91–93, 174–176, 238
 - complex, *see* complex Lorenz flow
 - polar coordinates, 176, 818
 - proto-Lorenz, 176
 - symmetry, 159, 176
- Lorenz, E.N., 68, 170
- loxodromic, 780
- quartet, 134, 140
- Lozi map, 68, 71
- Lyapunov
 - characteristic numbers, 114
 - covariant vector, 113–115
 - equation, 114, 597
 - exponent, 7, 95, 108–112, 765
 - cycle, 111
 - cycle expansion, 402
 - equilibrium, 551
 - natural measure, 358
 - numerical, 112, 115
 - function, 114
 - functional, 37
 - mode, 112, 114
 - orbit, 114
 - time, 7, 9, 24, 39, 59, 337, 343, 407, 424, 545
 - vector, 114
 - Lyapunov, A.M., 740
- manifold, 35
 - unstable, 245
- map, 35, 65–67
 - area preserving, 816
 - contracting, 94, 242
 - dike, 231, 242
 - dissipative, 94, 242
 - expanding, 222
 - fixed point, 73
 - Hénon, 71, 600, 816
 - Hamiltonian, 134
 - prime cycles, 602
 - Hamiltonian
 - Hénon, 134
 - iteration, 65
 - logistic, *see* unimodal
 - Lozi, 68, 71
 - once-folding, 249
 - order preserving, 229
 - orientation preserving, 816
 - orientation reversing, 816
 - quadratic, 72
 - return, 15, 59, 60, 124, 224, 238, 241, 247, 261, 266, 268
 - sawtooth, 159, 172, 454
 - stability, 82
 - tent, 240
 - unimodal, 227
- mapping, 67
- marginal
 - stability, 15, 78, 89, 96, 98, 188, 362, 466, 499, 512
 - cycle, 101, 188
 - fixed point, 512

marginal stability
 cycle, 466
 Markov
 chain, 233
 graph, *see* transition graph
 matrix, 287, 339, 358, 402
 partition, 421, 741
 finite, 222, 295
 infinite, 293
 not unique, 245
 Maslov index, *see* topological index
 material invariant, 581
 Mather, *see* Aubry-Mather theory
 matrix
 diagonalizing, 799
 exponential, 80, 842
 group, 151
 hermitian, 795
 invariant, 795
 irreducible, 287
 negative definite, 109
 of variations, *see* stability matrix
 positive definite, 109, 596
 product, 769
 representation, 151, 769
 stability, 76, 592
 matrix rep
 cyclic group, 451
 Maupertuis, P.L.M. de, 139, 281, 609
 mean, 347
 measure, 325
 continuous, 765
 invariant, 330
 natural, 68, 331, 338, 345, 414, 479,
 482, 748, 754
 mechanics
 quantum, 619
 statistical, 23
 mediocre
 convergence, 858
 memory
 m-step, 221
 finite, 296
 method of connections, 213
 metric
 entropy, 95
 entropy, Gauss map, 578
 indecomposability, 221, 859
 invariant, 97, 102
 Floquet multiplier, 102
 transitivity, 859
 microcanonical ensemble, 358
 Mira, C., 68
 Misiurewicz, M., 68
 mixing, 7, 16, 50, 70, 332, 345, 346,
 479, 504, 746, 859
 mode, normal, 818
 modulated traveling wave, 190
 Moebius inversion, 312
 moment, 347
 moment-generating function, 347, 522
 monodromy matrix, 82, 103, 362, 779
 Morse index, *see* topological index
 moving frame, 200, 201
 SO(2), 216
 multi-scattering matrix, 679
 multifractals, 884
 multiplicative cocycle, 87
 multiplicative ergodic theorem, 114
 multiplicative noise, 585, 588, 591, 594
 multiplier, Floquet, 98, 244
 multipoint shooting method, 276
 N-disk, transition matrix, 294
 natural density, *see* natural measure
 natural invariant, *see* natural measure
 natural measure, 68, 279, 331, 338, 345,
 358, 414, 479, 482, 502, 748,
 754
 nature, geometry of, 10
 Navier-Stokes equation, 537
 Navier-Stokes flow
 stability, 99
 negative definite matrix, 109
 neighborhood, 75, 103
 Nero, G., 439
 neutral, *see* marginal
 New York subway map, 245
 Newton method, 120
 convergence, 121
 damped, 121
 flows, 122
 optimal section, 834
 Newtonian dynamics, 127
 node, 289
 external, 290
 in-degree, 290
 internal, 290
 out-degree, 290
 noise
 Brownian, 584
 Gaussian, 591, 593, 895
 multiplicative, 585, 588, 591, 594
 white, 591
 non-hyperbolic
 systems, 482, 533, 535
 non-wandering set, 37, 251
 nonequilibrium, 414
 nonhyperbolic

flow, 99, 101
 norm, 911
 normal
 divisor, 154
 form, 763
 mode, 818
 washing machine, 149

 obscure
 foundations, 752
 jargon, 190, 220
 topology, 552, 557
 observable, 331, 337, 343, 362, 414, 422,
 479, 522, 531, 742, 839, 873,
 878, 894
 integrated, 343, 344, 349, 358, 363,
 377, 391, 856
 simultaneous, 800
 vector, 359
 ODEs, 43
 almost, 55
 1-disk
 creeping, 687
 scattering, 678
 semiclassical scattering, 684
 Onsager-Machlup, 594
 open system, 13, 353, 357, 380, 478,
 616, 620, 653, 676, 707, 721
 operator
 evolution, 349
 Hilbert-Schmidt, 912
 just a matrix, 803
 Koopman, 839, 843
 Liouville, 336
 norm, 911
 Perron-Frobenius, 327, 356
 positive, 912
 regularization, 918
 resolvent, 303, 352, 841
 semigroup
 bounded, 352, 841
 shift, 231, 233, 802
 stepping, 802
 trace-class, 911
 orbit, 36, 65, 154
 closed, 105
 group, 184
 inadmissible, 230
 Keplerian, 615
 periodic, 37, 233, 391, 654, 655
 pseudoperiodic, 469
 relative, 188
 returning, 653
 space, 201
 order preserving map, 229

 ordering
 spatial, 228, 252
 ordinary differential equations, *see* ODEs
 orientation
 preserving map, 816
 reversing map, 816
 orthogonality relation, 265, 770, 775, 800
 Oseledec ergodic theorem, 114
 out
 node, 89, 96
 spiral, 89, 96
 out-degree, 290

 Palais slice, 213
 palpitations, chicken heart, 6
 paradise
 this side of, 475
 partial differential equations, *see* PDEs
 partially hyperbolic
 invariant tori, 189
 orbit, 99
 partition, 221, 234
 state space, 325
 function, 348, 356
 generating, 234
 infinite, 242, 308, 315
 Markov, 222
 passive scalar, 581
 past topological coordinate, 253
 path integral
 stochastic, *see* Wiener integral
 PDEs, 35, 43
 period
 generalized, 469
 relation to action, 704
 relative, 186
 periodic
 orbit, 12, 37, 99, 105, 185, 233,
 391, 654, 655
 condition, 118, 123, 272, 599
 extraction, 118–123, 272–279, 599–
 609
 Hamiltonian repeller, 126
 inverse iteration, 119
 multipoint shooting, 276
 Newton method, 120–121
 relative, 186, 459, 467
 relaxation algorithm, 600
 short, 166, 190
 point, 12, 15, 19, 21, 37, 240, 826
 admissible, 303
 count, 311
 symbolic label, 233
 unstable, 13
 periodic orbit

- generalized, 469
- reduced, 469
- Perron-Frobenius
 - matrix, 287
 - operator, 327, 356, 487
 - theorem, 502, 508, 887
- phase space, 34, 130, *see* state space
 - 3-disk, 859
 - density, 335
 - vs. state space, 50
- physical space, *see* configuration space
- piecewise
 - constant function, 371
 - linear map, 533
 - linear map, intermittency, 514
 - linear map, repeller, 358
- pinball, *see* 3-disk
 - simulator, 148
- plain English, 190, 233
- plane Couette flow
 - relative solutions, 196
 - stability, 777
 - symmetries, 162, 171, 196
 - unstable manifold, 247
- Plemelj-Smithies cumulants, 916
- POD, 248
- Poincaré invariants, 137
- Poincaré return map, 59, 60, 261
 - cycle, 103
 - polynomial, 66
 - stability, 82
- Poincaré section, 12, 59–65, 261, 266, 268
 - 3-disk, 142
 - border, 73, *see* chart border
 - Hénon trick, 68
 - hyperplane, 69, 265
- Poincaré, H., 3, 8, 14
- point
 - non-wandering, 37
 - periodic, 12
 - symbolic label, 233
 - scatterer, 728
 - wandering, 37
- point-wise invariant, *see* G -fixed
- Poisson
 - bracket, 183, 335, 336, 338, 778
 - resummation, 22, 527
- polar coordinates, 766
- polar decomposition, 110, 115, 117
- Pollicott, M., 356, 531
- polylogarithm, 515
- polynomial
 - characteristic, 305
- topological, 307
- Pomeau, Y., 68
- positive definite matrix, 109, 596
- positive operators, 912
- post-processing, 202, 211
- potential problems, 55
- power law
 - correlation decay, 513
- pressure
 - thermodynamic, 356
 - topological, 356
- prime cycle, 119, 233, 272, 321, 363
 - 3-disk, 266, 321, 609
 - binary, 257, 266, 316
 - count, 311
 - Hénon map, 602, 612
 - ternary, 267
- prime periodic orbit, *see* prime cycle
- primitive cycle, *see* prime cycle
- principal
 - directions, 110
 - stretches, 110
- probabilistic zeta function, 531
- probability
 - density, Gaussian, 591
 - matrix, 287
- product
 - Lie, 769
 - matrix, 769
- professor
 - does not know this, 389
- profile, spatial, 35
- projection
 - operators, 798
- projection operator, 774, 799, 806, 807
 - complete, orthonormal, 807
- propagator, 620
 - semiclassical, 641
 - short time, 642, 648
 - Van Vleck, 643
- pruned
 - block, 235
- pruning, 11, 512
 - front, 255
 - 3-disk, 223, 271
- golden mean, 242, 295, 317, 321, 387, 822, 853
 - individual cycles, 320
 - primary interval, 231
 - rules, 295
 - symbolic dynamics, 234
- pseudo-cycle, 390
- pseudoperiodic orbit, 469
- quadratic map, 72

- quantization
 - Bohr-Sommerfeld, 615
 - semiclassical, 653
 - WKB, 623, 626
- quantum
 - chaology, *see* chaos, quantum
 - chaos, 617, 618, 658
 - dynamical localization, 140
 - evolution, 620
 - interference, 633
 - mechanics, 619
 - potential, 650
 - propagator, 620
 - resonances, 615
 - theory, old, 752
- quasiperiodic, 37, 469
- quotient
 - group, 154
 - space, 201
 - state space, 62, 155, 201
- radius of convergence, 373
- random
 - walk, 583
- random matrix theory, 618
- Rayleigh-Benard flow, 52
- recoding, 235, 257, 266
- rectangle, 252
- rectification
 - flows, 756
 - maps, 762
- recurrence, 37, 220
 - time, *see* return time
- reduced
 - periodic orbit, 469
- reduced state space, 155, 201, 202
- reflection, 158
- regular
 - group action, 202
 - representation, 437
- regular rep
 - cyclic group, 451
 - dihedral group, 452
- regularization, 658, 760
 - Green's function, 658
 - operator, 918
- relative
 - equilibrium, 184
 - orbit, 188
 - period, 186
 - periodic orbit, 186, 459, 467
 - solutions, 366
- relaxation algorithm, 600
- renormalization, 147
 - golden mean, 567, 575
- repeated index summation, 84, 132, 793
- repeller, 13, 38, 353, 617
 - piecewise-linear, 358
 - single fixed point, 487
- representation, 151
 - character, 463, 797
 - defining, 795
 - dual, 768, 794, 795
 - equivalent, 796
 - faithful, 796
 - irreducible, 438, 463
 - linear, 179
 - matrix, 464, 769, 796
 - regular, 437
 - space, 794
 - standard, 794
 - trivial, 462
- representative point, 34
- residue, 136
 - Greene's, 135
 - stability, 135, 140
- resolvent
 - kernel, 495
 - operator, 303, 352, 841
- resonances
 - complex, 616
 - quantum, 615
 - Ruelle-Pollicott, 356, 531
- resummation
 - intermittency, 526
- return map, 15, 124, 261, 266, 268
 - Rössler flow, 238
- return time, 531
 - distribution, 531
- returning orbit, 653
- reversible
 - dynamics, 39
- Riemann zeta function, 431, 534, 861
- right-handed rotation, 192
- Rolling Stones, 229
- root, 290
- rooted tree graph, 290
- Rössler
 - attractor, 60, 70
 - cycles, 124, 126, 283
 - equilibria, 55, 90, 238
 - flow, 50, 53, 55, 60, 69, 73, 94, 112
 - Lyapunov exponent, 117
 - return map, 238
 - web diagram, 241
- rotating wave, 184, 197
- rotation
 - counter-clockwise, 192
 - right-handed, 192

- Roux, Henriette, 28, 85
 Ruelle
 -
 -Pollicott resonances, 356, 531
 zeta function, *see* dynamical zeta function
 Ruelle, D., 29, 356, 531
 Runge-Kutta integration, 55
 running orbit
 Lorentz gas, 418
 Rutherford, 695
 Rydberg series, 705
 S^1 , *see* SO(2)
 saddle, 89, 96, 98
 saddle point, *see* stationary phase
 saddle-node bifurcation, 68
 sample variance, 347
 sausage, ($N+1$)-dimensional, 179
 sawtooth map, 159, 172, 454
 scalar multiplication, 768
 scattering
 3-dimensional spheres, 147
 elastic, 664
 Green's function, 669
 matrix, 665
 phase shift, 672
 point, 728
 schmactals, *see* fractal
 Schrödinger
 equation, 619
 equation, time-independent, 619
 picture, 910
 Schur's Lemma, 463
 Schwartzian derivative, 765
 section
 optimal, 834
 stroboscopic, 58
 section, Poincaré, 12, 59, 142, 261, 268
 secular equation, 773, 774, 799
 self-retracing cycle, 701
 self-similar, 21
 fractal, 290
 semiclassical
 approximation, 634
 Green's function, 649, 652
 propagator, 641
 quantization, 653
 resonances
 3-disk, 907
 spectral determinant
 collinear helium, 707
 wave function, 639
 semiclassical zeta function, 659
 semigroup, 327, 840
 dynamical, 39, 55, 81, 82, 97, 100, 113, 144
 evolution, 350
 operator, 352, 841
 sensitivity to initial conditions, 7, 30, 32, 108
 set, non-wandering, 251
 shadowing, 18, 19, 309, 411
 3-disk, 401
 shift, 233
 Bernoulli, 239, 489, 532
 finite type, 235
 full, 233, 294
 map, 562
 operator, 231, 233, 802
 sub-, 234
 short periodic orbit, 166, 190
 similarity transformation, 102
 simultaneous observables, 800
 Sinai, Ya., 29
 Sinai-Bowen-Ruelle measure, *see* natural measure
 single fixed point
 repeller, 487
 spectral determinant, 488
 singlet, 462, 470
 singular value decomposition, 115
 singular values, 109, 113, 116
 singularity
 branch cut, 519
 sink, 38, 89, 96, 98
 Sivashinsky, G.I., 555
 skeleton of chaos, 11, 13
 skewness, 348
 slice, 180, 201, 202, 213
 condition, 202
 linear, 202
 Palais, 213
 Smale, S., 10, 29, 244, 264, 314, 383, 740
 Newton's method, 120
 wild idea, 374, 382
 small divisor problem, 371
 S -matrix, 665
 smooth, 181
 conjugacy, 42, 102, 766
 dynamical system, 559
 dynamics, 18, 19, 27, 35, 310, 740, 887, 890, 891
 approximated, 855
 dynamics, spectral determinant, 507
 interaction, 893
 potential, 147
 SO(2), 181, 192, 203, 216

- SO(2), 89, 194–196, 198, 217, 766, 772
 irreducible representation, 192
 SO(3), 181, 751
 solution
 symmetry, 184
 Sommerfeld
 diffraction, 726
 source, 89, 96, 98
 Sp(d)
 symplectic group, 131
 space
 analytic functions, 504
 average, 331, 344
 configuration, 44, 50
 defining vector, 794
 density functions, 371
 dual, 768, 794
 linear, 767
 phase, 50
 state, 50
 vector, 767
 space average, 545
 span, 768
 spatial profile, 35
 spatiotemporal chaos, 44, 538
 spatiotemporal dynamics, 29
 spectral
 decomposition, 770, 775, 792, 800
 determinant, 22, 304, 373
 1-dimensional maps, 384
 2-dimensional hyperbolic Hamiltonian flow, 384
 1-dof, 660
 2-dof, 661
 entire, 384, 493
 for flows, 374
 infinite product rep., 375
 single fixed point, 488
 weighted, 385
 radius, 488, 496
 essential, 505
 stability, 422
 staircase, 621
 spectrum
 Balmer, 615
 specular reflection, 142
 speed, 39
 Spiegel, Edward A., 749
 SRB measure, *see* natural measure
 St. Augustine, 325
 stability, 75–85
 billiards, 106, 144
 continuous symmetry, 188
 eigenvalue, *see* Floquet multiplier
 elliptic, 371
 equations, 87
 exact, 107
 exponent, 77, 84, 86, 89, 91, 96,
 114, *see* Floquet exponent
 flow, 81
 Hamiltonian flow, 781
 Hamiltonian flows, 132, 778
 indifferent, 78
 linear, 75, 95, 551
 maps, 82
 marginal, 78, 188, 466
 matrix, 76, 87, 592
 matrix, symplectic, 132
 multiplier, 77, 86, *see* Floquet multiplier
 neutral, *see* marginal ordering
 cycle expansions, 403
 intermittent flows, 529
 Poincaré map cycle, 103
 Poincaré return map, 82
 residue, 135, 140
 spectral, 422
 structural, 251, 263, 310, 422
 subgroup, 160, 162
 window, 99
 stabilizer, 162, 163, 190
 stabilizer subgroup, *see* isotropy subgroup
 stable
 cycle, 106
 manifold, 15, 245–247, 267
 stable manifold, 265, 270
 stadium billiard, 142, 148, 170, 535, 815,
 817, 872
 stagnation point, *see* equilibrium point
 staircase
 mean eigenvalue density, 707
 spectral, 621
 standard deviation, 347
 standard map, 135, 140, 512
 standard representation space, 794
 standardized moment, 347
 standing orbit
 Lorentz gas, 418
 standing wave, 40, 196
 state, 220, 289
 set, 221
 state space, 34, 35, 130
 discretization, 45, 356
 equivariant, 202
 Fourier representation, 45
 high-dimensional, 43
 infinite-dimensional, 45

- partition, 325
- reduced, 155, 202
- volume \mathcal{M} , 353
- vs. phase space, 50
- states space
 - visualization, 44
- stationary
 - flow, 40
 - phase, 333, 610, 626, 629, 630, 645, 652, 676, 690, 718, 720, 901
 - phase approximation, 626, 632, 643, 654, 719, 728
 - point, *see* equilibrium point
 - state, 330
- stationary Lyapunov basis, 114
- statistical mechanics, 23
- steady state, *see* equilibrium point
- stepping operator, 802
- Sterling formula, 632
- stochastic
 - dynamics, 6, 333
 - matrix, 287
 - path integral, *see* Wiener integral
- Stokes theorem, 137, 638
- stosszahlansatz, 23, 424
- strange attractor, 37, 53, 108
 - Rössler flow, 60, 70
- stratum, 163
- stretch & fold, 71, 230, 240
- stretches, 110
- stroboscopic sections method, 58
- strongly connected graph, 289
- structural stability, 26, 251, 263, 310, 422, 425, 540, 731, 754
 - Hénon map, 270
- structure constant, 769
- subgroup
 - isotropy, 160, 162
- subshift, 234
 - finite type, 235, 255, 263, 288–290, 295
- super-exponential
 - convergence, 599
- superstable
 - cycle, 106
 - fixed point, 599
- surjective, 72
- survival probability, 14, *see* escape rate
- SVD, *see* singular value decomposition
- symbol
 - sequence
 - inadmissible, 234
 - square, 252
 - symbol square, 252
- symbolic dynamics, 11, 220–235, 820–828
 - 3-disk, 32, 222, 271
 - at a bifurcation, 147
 - binary
 - collinear helium, 699
 - coding, 235
 - transition graph, 402
 - complete, 236, 240, 251, 294
 - covering, 233
 - grammar, 234
 - Hénon-Heiles, 170
 - pruned, 234
 - recoding, 235, 257, 266
 - unimodal, 227
 - symmetric group, 158
- symmetry
 - D_3 , 268, 446
 - 3-disk, 159, 173, 175, 258, 268, 446, 457
 - continuous, 178–189, 199–210
 - cyclic, 316
 - discrete, 169, 257, 266
 - dynamical system, 152, 178, 199, 465
 - Hénon map, 816
 - of a solution, 162, 163, 169, 190
 - solution, 184
 - under G_p , 162
 - symmetry-reduced space, 201
- symplectic, 99
 - 2-form, 130
 - dimension, 139
 - group $Sp(d)$, 131
 - group $Sp(2D)$, 779
 - Hénon map, 134
 - integrator, 842
 - invariance, 128, 138, 778
 - map, 132
 - transformation, 131, 132, 249, 336
- system
 - open, 353
- syzygy, 175, 176, 209, 210
- tangent
 - bundle, 39, 76
 - field, 182
 - field, group, 183
 - linear equations, 78
 - map, *see* stability matrix
 - space, 76, 182
- tangent linear propagator, 87
- tangent map, 87
- Tauberian theorem, 534
- teaching

- combinatorics, 228
- template, 125, 238
- tent map, 240, 765, 766
- ternary
 - prime cycles, 267
- tessellation
 - smooth dynamics, 855
- thermodynamical
 - pressure, 356
- 3-body problem, 617, 695, 736, 753, 758
- 3-dimensional sphere
 - scattering, 147
- 3-disk
 - boundary orbits, 444
 - convergence, 498, 855
 - cycle
 - analytically, 283
 - count, 156, 169, 448, 838
 - expansion, 412
 - escape rate, 359, 401, 412, 475
 - fractal dimension, 867
 - geometry, 142
 - hyperbolicity, 363
 - phase space, 859
 - pinball, 5, 144, 147
 - point scatterer, 728
 - prime cycles, 17, 266, 281, 321, 609
 - pruning front, 223, 271
 - semiclassical resonances, 907
 - shadowing, 401
 - simulator, 148
 - state space, 13, 269, 867
 - symbolic dynamics, 11, 32, 222, 271
 - symmetry, 159, 173, 175, 258, 268, 446, 457
- time
 - arrow of, 23
 - as parametrization, 43
 - average, 332, 343
 - ceiling function, *see* ceiling function
 - delay, Wigner, 672
 - ordered integration, 81, 85
 - turnover, 90, 92, 772
 - time average, 545
 - time- t forward map, 50, 67, 184
- topological
 - conjugacy, 229
 - dynamics, 220, 232, 234, 235, 288
 - entropy, 7, 300, 308
 - future coordinate, 229
 - index, 640
 - topological index, 656, 753
 - invariant, 97
 - Markov chain, 233
 - parameter, 231
 - polynomial, 307
 - trace formula, 303
 - transitivity, 287
 - zeta function, 307, 308
- torus, 37
- totient function, 565
- t_p cycle weight, 375
- trace
 - formula
 - classical, 22
 - flows, 365
 - Gutzwiller, 656
 - maps, 364, 488
 - symmetry reduced, 467
 - topological, 303, 307
 - weight, 394
 - local, 316
- trace-class operator, 681, 911
 - determinant, 913
- trajectory, 36, 79
 - discrete, 65
- transfer
 - map, 140
 - matrix, 140, 339, 358
 - operator, 371, 382
 - spectrum, 384
- transformation
 - canonical, 249
 - coordinate, 766
 - symplectic, 249
- transient, 37, 222, 297
- transition
 - graph, 286–293
 - infinite, 306
 - matrix, 286, 300, 316
 - matrix, N -disk, 294
- transitive, 38
- transplacement gradient, 87
- transversality
 - border of, 73, *see* chart border
 - condition, 60
 - Thom's, 754
- transverse stability, 648
- traveling wave, 184, 197, *see* relative equilibrium
- tree graph, 290
- trivial
 - representation, 462
- Trotter product formula, 910
- truncation
 - Fourier, 45, 541
 - Gälerkin, 46, 548
- turbulence, 8, 9, 554

- problem of, 537
- turnback point, 248
- turnover time, 90, 92, 772
- two-mode flow, 178, 190, 193, 194, 198, 217
- equivariance, 195
-
- U(1), 192, 216
- Ulam map, 240, 283, 765, 766
 - skew, 339, 484
 - tent, 341, 387
- ultraviolet divergence, 657
- unimodal
 - kneading value, 242
 - map, 227
 - map, symbolic dynamics, 227
 - well ordered symbols, 242
- unstable
 - cycle, 106
 - manifold, 15, 245–247, 267
 - periodic orbit), *see* periodic orbit
 - periodic point, 13
- unstable manifold, 265, 270
- unsung
 - heroes, iii, viii
- UPO (Unstable Periodic Orbit), *see* periodic orbit
-
- van Kampen, N. G., 594
- Van Vleck
 - propagator, 643
- variance, 347
- variational principle, 593
- vector
 - basis, 768
 - field, 39
 - field, singularities, 756
 - invariant, 795
 - observable, 359
 - space, 767
 - defining, 794
 - dual, 794
- velocity, 39
- velocity gradients matrix, 76, 87
- vertex, 289
- visitation frequency, 331
- visitation sequence, *see* itinerary
- volume preservation, 146
- von Neumann
 - ergodicity, 843
-
- Waleffe, F., 750
- walk, *see* itinerary
- wandering point, 37
- wave function
-
- semiclassical, 639
- WKB, 640
- wave, standing, 40, 196
- web diagram
 - Rössler flow, 241
- weight
 - multiplicative, 28
- well ordered symbols
 - unimodal, 242
- Wentzel-Kramers-Brillouin, *see* WKB
- Weyl
 - rule, 656
- Weyl, H., 469, 798
- white noise, 591
- Wiener integral, 592
- Wigner delay time, 672
- winding number, 136, 562, 563
- WKB, 623, 634
 - connection formulas, 629
 - quantization, 623, 626
 - wave function, 640
-
- Yang, C.N., 331
- Young, L.-S., 68
-
- zero eigenvalue, 630, 645
- zero, false, 379
- zeta function
 - Artin-Mazur, 307
 - dynamical, 17, 376
 - probabilistic, 531
 - Ruelle, *see* dynamical
 - topological, 307, 308