

Index

- ABC conjecture, 357
 Abel summation, 152, 196, 347, 350, 354
 abelian group character, 277
 absolutely continuous measure, 445
 admissible real function, 236, 267
 admissible zero set, 38
 Akbary, A., 312, 327, 473
 Akhiezer, N. I., 94, 414, 473
 Alaca, S., 117, 473
 Alfors, L., 10, 129, 473
 algebraic closure, 177
 almost everywhere, 381
 Alzer, H., 418, 473
 Amoroso criterion, 4, 117–126
 Amoroso, F., 117–125, 473
 Anderson, J., 194, 208, 473
 Andrade, J., 92, 473
 Andrews, G. E., 418, 473
 angular frequency Fourier transform, 389
 Apostol, T. M., 10, 40, 129, 194, 216, 277, 473
 area element, 209
 Arias de Reyna, J., 59, 473
 Artin's primitive root conjecture, 276, 310, 324
 Artin, E., 174, 189
 Askey, R., 418, 473
 Assumption (*), 255
 automorphic L -function, 92, 116

 Báez-Duarte convolution criterion, 3, 17
 Báez-Duarte series criterion, 3, 19
 Báez-Duarte, L., 9, 16–22, 36, 474
 background reading, 7, 10, 25, 40, 66, 94, 129, 178, 179, 194, 223, 277, 292, 294, 335
 Bagchi, B., 36, 474
 Baker, R. C., 331
 Balasubramanian, R., 290, 474

 Balazard, M., 35, 36, 128, 474
 Balazard–Saias–Yor criterion, 128
 Banach space, 442–450
 Bateman, H., 413
 Beckman, B., 25, 474
 Beltraminelli, S., 128–138, 481
 Bernoulli polynomial, 424
 Berry, M. V., xix
 Bertrand, J., 409, 474
 Bertrand, P., 409, 474
 Bessel function, 213
 Beurling criterion, 25–36
 Beurling, A., 23, 28–35, 474
 bilateral Laplace transform, 405
 bilateral Laplace transform regularity, 407
 Blaschke product, 23–27, 34, 136
 Bombieri variational criterion, 5, 151, 172
 Bombieri, E., xix, 1, 2, 6, 39, 59, 117, 150, 166–174, 221, 274, 312, 327, 329, 474
 Bombieri–Vinogradov estimate, 6, 276
 Bombieri–Vinogradov theorem, 311–327
 Borel–Carathéodary theorem, 365
 Borwein, P., 7, 474
 bounded variation, 379
 Broughan, K. A., xviii, 10, 125, 150, 173, 242, 292
 Brown, F. C. S., 60, 474
 Bruckner, A. M., 445, 474
 Bruckner, J. B., 445, 474
 Burnol, J.-F., 36, 474

 Cardon, D. A., 93–116, 475
 Cardon–Roberts criterion, 4, 93–116
 Carleman's formula, 367
 Carleman's inequality, 106
 Carleman's theorem, 108

Carleman's vanishing condition, 369
 Carleman, T., 475
 Carlson, T., 437
 Cassels, J. W. S., 179, 475
 central non-vanishing conjecture, 277
 Cesaro sum, 394
 chain, 444
 Chang, A., 92, 473, 475
 character Fourier expansion, 278
 CharacterConductor (GRHpack), 461
 CharacterOrder (GRHpack), 461
 CharacterTimes (GRHpack), 461
 CharacterValue (GRHpack), 461
 Chebyshev's conjecture, 276
 Chen, J. R., 311, 475
 Cheney, E. W., 94, 129, 335, 475
 Chihara, T. S., 94, 475
 ChiNM (GRHpack), 461
 ChiNN (GRHpack), 462
 Choi, S., 7, 474
 Chowla, S., 324
 class number, 281
 Coffey, M. W., 39, 59, 475
 Cohen, H., 294, 475
 completed Eisenstein series, 211
 complex function theory, 363–376
 ComputeHeight (GRHpack), 462
 conductor, 279
 Connes, A., 1, 174, 475
 Conrey, J. B., 1, 2, 277, 290, 328, 329, 475
 continuity of the integral, 385
 CountSmoothIntegers (GRHpack), 462
 cross-ratio, 209
 cryptography, 178
 Csordas, G., 4, 63, 66, 77, 475
 cyclotomic polynomial, 118
 CyclotomicProduct (GRHpack), 463

 Dacorogna, B., 167, 475
 Davenport, H., 274, 277, 292, 475
 Davies, B., 129, 475
 de Bruijn, N. G., 4, 65, 66, 474
 de Bruijn–Newman constant, 4, 62–92
 de Bruijn–Newman criterion, 4, 62
 De Koninck, J.-M., 15, 277, 298, 335, 478
 Dedekind zeta function, 60, 174, 280
 degree of a divisor, 183
 degree of a map, 182
 Delbourgo, D., xix
 Deligne, P., 151, 174, 176, 190, 475
 Demichel, P., 4, 63, 92
 Deshouillers, J.-M., 326, 475
 determined Hamburger moment problem, 96
 Deuring, M., 292, 476

Dickman function, 332, 334–339
 Dickman, K., 332, 476
 DickmanRho (GRHpack), 463
 Dieudonné, J. A., 176, 476
 differentiation of integrals, 386
 direct limit, 177
 direct method, 166
 Dirichlet L -function, 6, 60, 174, 274–331, 357
 Dirichlet character, 277
 Dirichlet class number formula, 282
 Dirichlet, J. L., 6, 274–285, 295
 DirichletCharacterQ (GRHpack), 463
 DirichletCharacters (GRHpack), 463
 DirichletCoefficientProduct (GRHpack), 463
 DirichletCoefficients (GRHpack), 464
 DirichletInverse (GRHpack), 464
 DirichletProduct (GRHpack), 464
 discrete measures, 193–206, 219–220
 discrete subgroup, 211
 DiscreteMeasure (GRHpack), 464
 discriminant of an elliptic curve, 180
 distribution function, 95
 divisor on a curve, 151, 183
 Donoghue, W. F., 29, 227, 476
 double series convergence, 362
 Droll, A. D., 61, 476
 du Sautoy, M., xvii, 2, 481
 dual isogeny, 151, 184
 Dumitrescu, C., 39, 481

 Edwards, H. M., 40, 41, 47, 79, 94, 138, 139, 335, 476
 effective zero bound, 293
 Effinger, G., 326, 475
 EH conjecture, 329
 Eisenstein series, 194, 211–216
 Elliott, P. D. T. A., 329, 476
 Elliott–Halberstam conjecture, 277, 329
 elliptic curve, 151, 178–182
 EllipticCount (GRHpack), 465
 Ellison, F., 277, 476
 Ellison, W., 277, 476
 entire function of finite order, 373
 Epstein, B., 25, 476
 Erdélyi, A., 413
 ergodic, 207
 Estala-Arias, S., 194, 220, 476
 Euler, L., 325
 Euler–Lagrange linear operator, 171
 EvenCharacterQ (GRHpack), 465
 EvenFundamentalCharacter (GRHpack), 465
 evenly positive semi-definite, 229
 exceptional zero, 291
 explicit formula, 152–154, 221
 explicit formula for L -functions, 295

- ExplicitBombieriVinogradov (GRHpack), 465
 ExplicitGallagher (GRHpack), 466
 extremal, 166
- Falconer, K. J., 219, 476
 Farey sequence, 119
 Farey set, 119
 Farmer, D. W., 277, 329, 475
 Fejer kernel function, 394
 Fejer's theorem, 393
 finite field, 176–179
 Fiorilli, D., 290, 476
 Fomin, S. V., 167, 476
 FormBound (GRHpack), 466
 Fourier convolution, 398
 Fourier inversion, 391
 Fourier transform, 25, 62, 107, 388–404
 Fourier transform derivative, 390
 Fourier transform examples, 401
 Fourier transform existence, 389
 Franel, J., 125, 476
 free action, 210
 Freitas, P., 59, 476
 Friedlander, J. B., 1, 329, 474, 476
 Frobenius automorphism, 177
 Fulton, W., 189, 476
 function field, 182
 function field L -function, 92
 functional, 166
 fundamental character, 280, 294
 fundamental discriminant, 280, 291, 294
 fundamental domain, 211
 fundamental subset, 23
 fundamental unit, 282, 294
 FundamentalCharacterQ (GRHpack), 466
 FundamentalDiscriminants (GRHpack), 467
 FundamentalDiscriminantQ (GRHpack), 466
- Galbraith, S. D., 178, 476
 Gallagher's estimate, 6, 276
 Gallagher's theorem, 298–311
 Gallagher, P. X., 6, 302, 311, 312, 476
 Galois extension, 177
 gamma duplication, 421
 gamma Euler–Maclaurin summation, 421
 gamma function, 418–424
 gamma log derivative, 418
 gamma reflection, 420
 Garunkstis, R., 39, 476
 Gauss character sum, 283
 Gauss class number problem, 276, 294, 326
 Gauss quadrature formula, 100
 Gauss, C. F., 325, 476
 GaussCharacterSum (GRHpack), 467
- Gaussian curvature, 208
 GEH conjecture, 329
 Gelfand, I. M., 167, 476
 generalized Elliott–Halberstam conjecture, 329
 generalized Riemann hypothesis, 6, 283
 geodesic, 208
 Goldbach's conjecture, 311
 Goldfeld, D., 194, 294, 476
 Goldston, D. A., 277, 330, 477
 Gourdon, X., 4, 63, 92
 Gowers, T., 294, 477
 Gradshteyn, I. S., 403, 477
 Gram–Schmidt procedure, 96, 259
 Granville, A., 294, 329, 330, 335, 357, 476, 477
 GRH, 6, 174, 274–276, 283, 291, 296, 325, 326, 358, 359, 471
 GRH related conjectures, 327–331
 GRH Titchmarsh criterion, xviii
 GRHpack, xviii, 459–472
 group law, 181
 group of an elliptic curve, 180
 Gupta, R., 324, 477
- Hörmander, L., 94, 227, 477
 Habsieger, L., 36, 477
 Hadamard factorization, 374
 Hahn–Banach theorem, 127, 142, 443
 Halberstam, H., 329, 476
 Hambrook, K., 312, 327, 473
 Hamburger moment problem, 93, 96, 110
 Hardy space, 36, 136
 Hardy's Tauberian theorem, 395
 Hardy, G. H., 8, 9, 477
 Hardy–Littlewood criterion, 3, 8, 15
 Harnack's lemma, 28
 Harris, M., 9, 477
 Hasse bound, 186
 Hasse, H., 150, 175, 186, 189
 Heath-Brown, D. R., 294, 324, 477, 481
 height of a polynomial, 117, 119
 Heilbronn, H., 292, 477
 Heilbronn–Deuring phenomenon, 292
 Helfgott, H. A., 326, 477
 Helly's selection principle, 170
 Hermite normal form, 456
 Hermitian form, 221–273, 482
 Hilbert modular orbifolds, 194
 Hilbert space, 442–450
 Hildebrand criterion, 7, 333, 346–356
 Hildebrand, A., xix, 7, 333, 335, 477
 history of distributions, 227
 Hoffstein, J., 178, 477
 Holmes, G., xix
 holomorphic Fourier transform, 389
 Hooley, C., 324, 477

488

horocycle, 194, 216
 Horváth, J., 227, 477
 Huxley, M., 326
 hyperbolic geometry, 194

imprimitive character, 279
 induced modulus, 278
 InducedCharacterQ (GRHpack), 467
 InducedCharacters (GRHpack), 467
 InducedModulusQ (GRHpack), 468
 ineffective constant, 291
 inert prime, 280
 infinite product convergence, 371
 integrable function, 382
 integral equations, 127–149
 inverse limit, 183
 Ireland, K., 294, 477
 Irving, A. J., 331
 isogeny, 181
 isometry, 209
 Ivić, A., 2, 7, 40, 334, 428, 478
 Iwaniec's dream, 292
 Iwaniec, H., 1, 2, 194, 292, 294, 326, 328, 329, 474, 476, 478

Jacobi symbol, 279, 291
 Jacobson, N., 176, 478
 Jameson, G. J. O., 25, 478
 Jensen's formula, 365
 Joe, S., xix
 Jost, J., 167, 478
 Jutila, M., 290, 294, 326, 478

Karatsuba, A. A., 40, 478
 Katz, N. M., 176, 190, 478
 Ki, H., 63, 65, 478
 Kim, Y.-O., 63, 65, 478
 Koblitz, N., 194, 478
 Kowalski, E., 194, 328, 478
 Kronecker symbol, 279
 Kubota, T., 215, 219, 478

l -adic cohomology, 92
 Lagarias' criterion, 3
 Lagarias' positivity criterion, 38
 Lagarias, J. C., xix, 3, 38, 39, 59, 334, 357, 474, 478
 Laguerre–Pólya class, 66, 77
 Landau's RH zeta bound, 436
 Landau, E., 125, 436, 437, 478
 Landreau, B., 36, 473, 478
 Lang, S., 10, 117, 478
 Laplace transform, 405–408

Index

Laplace transform analyticity, 406
 Laplace transform convergence, 405
 Laplace transform inverse, 408
 Lebesgue bounded convergence theorem, 382
 Lebesgue integral, 381–387
 Lebesgue measurable, 381
 Lebesgue outer measure, 381
 Lefschetz fixed point theorem, 191
 Legendre symbol, 279
 Lehmer pair of zeros, 4, 66, 79, 80, 86, 92
 Lehmer's phenomenon, 66, 78, 79
 Lenstra, H. W., 294, 475
 Levinson criterion, 3, 5, 128, 129, 146
 Levinson, N., 128
 Li criterion, 3, 39
 Li, X.-J., 39, 54–58, 478
 Li-Jost, X., 167, 478
 Lindelöf's bound, 369
 lines, 208
 Linnik's constant, 294, 324
 Linnik's theorem, 275, 276
 Linnik, U. V., 275, 276, 294, 311, 324, 478
 Littlewood's first zeta estimate, 432
 Littlewood's second zeta estimate, 434
 Littlewood, J. E., 4, 8, 9, 125, 128, 129, 437
 local discrepancy of a set, 119
 log gamma Stirling's approximation, 424
 long Weierstrass form, 179
 Lorch, E. R., 25, 479
 Low, M., 290, 479
 Luca, F., 15, 277, 298, 335, 478

Möbius transformation, 209
 Müntz–Szász theorem, 128
 Mahler measure of a polynomial, 119
 Marcus, D. A., 117, 479
 Masser, D. W., 357, 479
 Mathematica, xviii
 Mathematics Genealogy Project, 9, 479
 Matiyasevich, Y., 60, 479
 maximal element, 444
 maximum norm of a polynomial, 119
 Mayer, H., 333
 Maynard, J., 277, 330, 331, 479
 Mazhouda, K., 4, 60, 61, 94, 116, 479, 480
 Mazur, B., 1, 479
 measurable function, 381
 Mehrle, D., 92, 475
 Mellin convolution, 160
 Mellin transform, 152, 194, 197, 409–417
 Mellin transform convergence, 409
 Mellin transform inverse, 409
 Mellin transform properties, 410
 Mellin transform tables, 413
 Mellin, H., 409, 479

- Merlini, D., 128–138, 481
 Mertens' conjecture, 65
 Mertens, F., 301, 479
 Miller, S. J., 92, 329, 473, 475, 479
 Milne, J., 179, 479
 minimax theorem, 454
 minimizing sequence, 166
 modular forms, 194
 modular group, 211
 mollifier, 267
 moment functional, 96
 moments of a distribution function, 95
 Montgomery, H. L., 277, 292, 335
 Moree, P., 324, 335, 479
 morphism, 182
 Mullen, G. L., 176, 479
 Mummert, C., 176, 479
 Murty, M. Ram, 277, 290, 324, 327, 477, 479
 Murty, V. Kumar, 277, 290, 327, 474, 479
- Naccache, D., 335, 479
 Narkiewicz, W., 117, 479
 Nathanson, M. B., 277, 301, 479
 negative set, 445
 Newman's conjecture, 63, 92
 Newman, C. M., 4, 63, 77, 479
 NIST, 409, 480
 no Siegel zeros conjecture, 277
 non-degenerate form, 260
 non-Euclidean geometry, 206–211
 non-principal character, 279
 Norfolk, T. S., 63, 66, 77, 475, 480
 norm of a divisor, 189
 Norton, K. K., 335, 480
 null set, 445
 Nyman criterion, 23, 36
 Nyman, B., 23, 480
 Nyman–Beurling criterion, 3, 23, 29
- Oberhettinger, F., 413, 480
 odd Goldbach conjecture, 276, 326
 OddCharacterQ (GRHpack), 468
 OddFundamentalCharacter (GRHpack), 468
 oddly positive semi-definite, 229
 Odlyzko, A. M., 63, 65, 66, 475
 Oesterlé, J., 294, 357, 480
 Omar, S., 4, 60, 61, 94, 116, 479, 480
 Ono, K., 325, 480
 order of an entire function, 71, 373
 orientation-preserving isometry, 210
 orthogonal polynomials, 93–116
 orthogonality relations, 278, 296
 Ovarlez, J.-P., 409, 474
- Pólya, G., 63, 65, 66, 73, 477, 480
 Paley–Wiener theorem, 400
 Parseval's product, 397
 partially ordered set, 444
 Patrick, M. L., 81, 480
 Patterson, S. J., 40, 194, 409, 480
 Perelli, A., 326, 480
 perfect field, 176, 182
 period of a character, 277
 Petersen, K. L., 327, 479
 Pintz, J., 277, 326, 330, 477, 480
 Pipher, J., 178, 477
 Plancherel formula, 233
 Plancherel's theorem, 397
 PlotRealDirichletL (GRHpack), 468
 point at infinity, 180
 points, 208
 Poisson summation, 396
 Poisson's formula, 28
 Polymath, 330
 positive definite form, 260
 positive definite moment functional, 96
 positive divisor, 189
 positive semi-definite form, 260
 positive set, 445
 prime divisor, 189
 prime field, 176
 primitive character, 279
 primitive root, 308
 PrimitiveCharacterQ (GRHpack), 468
 PrimitiveCharacters (GRHpack), 469
 principal character, 277, 279
 PrincipalCharacter (GRHpack), 469
 PrincipalCharacterQ (GRHpack), 469
 ProbPosDefQ (GRHpack), 469
 properly discontinuous action, 211
 Purdy, G., 290, 480
 Pustyl'nikov, L. D., 39, 480
- quadratic character, 280
 quadratic form on an abelian group, 185
 quadratic reciprocity, 279
 QuadraticCharacterQ (GRHpack), 469
 quasi-analytic class, 105
 quasi-analytic function, 93, 105
- Rényi, A., 311, 480
 Radon–Nikodym theorem, 127, 142
 Ramanujan, S., 9, 301, 480, 482
 Ramaré, O., 326, 480
 ramified prime, 280
 ratios conjecture, 277
 Rayleigh's principle, 453
 reader's guide, 7
 real entire function, 71

490

Index

- real Fourier transform, 389
- RealCharacterQ (GRHpack), 470
- RealCharacters (GRHpack), 470
- rearranging theorem, 361
- Reiter, S. T., 92, 475
- relations between transforms, 417
- RH, xvii, 1, 37, 126, 128, 150, 174, 194, 274, 359
- RH analytic criteria, xviii
- RH arithmetic criteria, xvii
- Ribenboim, P., 325, 480
- Richard, F., 36, 478
- Riemann hypothesis, xvii, 1, 8, 12, 15, 17, 20, 23, 39, 174, 326
- Riemann sphere, 209
- Riemann xi function, 37–58
- Riemann zeta function, 425–441
- Riemann, B., 480
- Riemann–Lebesgue lemma, 194, 388
- Riemann–Siegel function, 66, 78
- Riemann–Siegel theta function, 78
- Riemann–Stieltjes integral, 377–380
- Riemann–Stieltjes integrator, 377
- Riemann–Stieltjes mean-value theorem, 380
- Riemann–Stieltjes sum, 377
- Riesz (GRHpack function), 470
- Riesz criterion, 3, 8, 12
- Riesz function, 10–15
- Riesz representation theorem, 442
- Riesz, M., 8, 15, 480
- Roberts, S. A., 93, 475
- Robin, G., 3, 7, 296, 480
- Rooney, B., 7, 474
- root number, 283
- RootNumber (GRHpack), 470
- Rosen, M., 294, 477
- Rosser, J. B., 290
- Roy, R., 418, 473
- Royden, H. L., 25, 194, 445, 480
- Rudin, W., 25, 129, 148, 194, 223, 227, 480
- Ruttan, A., 63, 66, 475
- Ryzhik, I. M., 403, 477

- Sabbagh, K., xvii, 480
- saddle point method, 341
- Saïas, E., 35, 36, 128, 474
- Saidak, F., 60, 479
- Salem criterion, 3
- Salem, R., 127, 481
- Salerno, S., 326, 480
- Saouter, Y., 4, 63, 92, 481
- Sarnak, P., 1, 2, 5, 193, 194, 219, 481
- Schechter, M., 129, 481
- Schmidt, F. K., 174, 189
- Schwartz distribution, 222, 226

- Schwartz, L., 227, 481
- Schwarz lemma, 26, 364
- Sekatskii, S. K., 60, 128–138, 481
- Sekatskii–Beltraminelli–Merlini criterion, 5, 128, 138
- Selberg class, 40, 60, 61
- Selberg, A., 1, 150
- separable extension, 182
- sequentially lower semi-continuous, 167
- series convergence, 361–362
- series equivalents, 8–22
- series of Hardy and Littlewood, 15–16
- series rearrangement, 361
- Shohat, J. A., 96, 481
- short Weierstrass form, 180
- Shparlinski, I. E., 335, 479
- Siegel zero, 6, 275, 279, 288–294, 325, 357
- Siegel’s theorem, 291
- Siegel, C. L., 6, 60, 79, 275, 357, 481
- Siegel–Walfisz condition, 329
- Siegel–Walfisz theorem, 302
- signed measure, 445
- Silverman, J. H., 178, 179, 477, 481
- simple function, 382
- Skovgaard, H., 81, 481
- Smajlović, L., 61, 481
- SmallestEigenvalue (GRHpack), 471
- Smith normal form, 457
- Smith, W., 63, 66, 475
- smooth function, 226
- smooth integer, 332–335, 358
- SmoothIntegerQ (GRHpack), 471
- smoothness exponent, 358
- Snaith, N. C., 328, 329, 475
- Sondow, J., 39, 481
- Sondow–Dumitrescu criterion, 3, 39, 50
- Soundararajan, K., 290, 325, 334, 357, 475, 478, 480, 481
- spectrum of a distribution function, 95
- split prime, 280
- Stahl, J., 92, 475
- Stahl, S., 208, 481
- Stark, H. M., 357, 477
- steepest descent, 341
- Steiger, A., 41, 481
- Stein, W. A., 1, 479
- step function example, 163
- Stirling’s formula, 424
- substantially equal distribution functions, 95
- sum of three squares conjecture, 325

- Tamarkin, J. D., 96, 481
- Tao, T., 277, 326, 330, 481
- Tate module, 151, 183, 184
- Tate, J., 151, 183, 184, 481

- te Riele, H. J. J., 326, 475
 Tenenbaum, G., 335, 477, 481
 Thomson, B. S., 445, 474
 Thorne, J., 327, 481
 three circles theorem, 363
 three lines theorem, 363
 Titchmarsh criterion, 6, 275, 295–298
 Titchmarsh, E. C., 40, 275, 437, 481
 TitchmarshRemainder (GRHpack), 471
 topological group, 211
 topological vector space, 226
 total variation, 379
 Tréves, F., 227, 481
 transfinite induction, 444
 transition morphisms, 183
 transitive action, 210
 Trudgian, T. S., xix
 Turner, J. C., xix
 twin primes conjecture, 6, 277, 294

 unimodular transformation, 281
 upper half plane, 194, 208–211

 Varga, R. S., 63, 65, 66, 77, 475
 Vasilenko, O. N., 178, 481
 Vaughan, R. C., 277, 292, 311, 335, 479, 481
 Verger-Gaugry, J.-L., 126, 482
 Verjovsky criterion, 5, 193, 200–206
 Verjovsky, A., 193–206, 219, 482
 Vinogradov, A. I., 274, 276, 312, 326, 327, 329, 482
 Volchkov, V. V., 128, 482
 Volume Two summary, 2–7
 Voronin, S. M., 40, 478
 Voros, A., 59, 482

 Wang criterion, 127
 Wang, F. T., 127, 482
 Watkins, M., 290, 294, 482
 Watson, G. N., 10, 482
 weak ABC conjecture, 358
 weak Goldbach conjecture, 326
 weak XYZ conjecture, 358
 website for this book, xviii
 Weierstrass M -test, 370
 Weierstrass factorization, 371
 Weierstrass normal form, 180

 Weierstrass product, 38
 Weil conjectures, 5, 92, 173–176, 178, 179, 182
 Weil conjectures applications, 188–190
 Weil conjectures history, 174
 Weil criterion, 150, 159–166
 Weil explicit formula, xviii, 5, 6, 59, 154–159, 174, 190
 Weil pairing, 151, 184
 Weil's commentary, 151, 192
 Weil's functional, 221
 Weil, A., 150–192, 221, 325, 482
 WeilStepFunction (GRHpack), 471
 Weirathmueller, A., 7, 474
 Weyl's eigenvalue inequality, 455
 Whittaker, E. T., 10, 482
 Widder, D. V., 405, 482
 Wiener, N., 127, 482
 Wilf, H. S., 15, 482
 Williams, K. S., 117, 473
 Wilson, M., xix
 Wolf, M., 10, 22, 475

 Xi (GRHpack), 472
 xyz conjecture, 358

 Yakubovich, S., 129, 482
 Yildirim, C. Y., 277, 330, 477
 Yor, M., 128, 474
 Yoshida criterion, 6, 221–273
 Yoshida, H., 6, 174, 221–273, 482
 Yosida, K., 221, 227, 482
 Yott, D., 92, 475

 Zagier criterion, 194, 216–219
 Zagier, D., 5, 193, 216–219, 483
 zero count bound, 373
 zero-free region for an L -function, 289
 zeta critical strip bound, 431
 zeta Laurent series, 428
 zeta log derivative RH bound, 437
 zeta zero counting, 425
 Zhang, Y., 277, 330, 331, 483
 Zinoviev, D., 326, 475
 Zirnbauer, M. R., 277, 329, 475
 Zorn's lemma, 444
 Zvengrowski, P., 60, 479