

Index

- (t, s) -index, 436
- G-equivariant, 23
- G-orbits, 359
- R-algebra, 68
- S-ideal, 53
- T-equivalence, 47
- T-ideal, 47
 - index, 473
 - irreducible, 446
 - primary, 446
 - proper, 53
 - verbally prime, 533
- T_+ -ideal, 47
- T_2 -equivalence, 502
- T_2 -ideal, 501
- \mathcal{V} -polynomials, 67
- μ -dimension, 574
- d -bad, 193
- m -representable, 394
- n -ary operation, 66
- q invariant, 474

- abstract Cayley–Hamilton theorem, 457
- admissible in A , 545
- affine PI algebras, 429
- affine scheme, 33
- Albert, 21
- algebra
 - Aut-prime, 535
 - n -Cayley–Hamilton, 324
 - affine, 33
 - algebraic, 1
 - Azumaya, 125, 127, 151, 160, 282, 373
 - basic, 437
 - degree of a simple, 386
 - étale, 33
 - formally smooth, 33
 - free, 41, 50
 - free Schur, 117
 - full, 438
 - fundamental, 438
 - group, 25
 - Hopf, 45
 - integral, 221
 - Lie, 44
 - local finiteness, 1
 - locally finite, 287
 - multigraded, 51
 - Noetherian, 29
 - noncommutative trace, 63
 - of fractions, 31
 - opposite, 8
 - PI algebra, 55
 - PI equivalent, 55
 - prime, 16
 - reduced, 33, 438
 - relatively free, 50
 - representable, 303
 - separable, 146, 147
 - simple, 11
 - split, 435
 - super, 24
 - trace, 56, 63, 107, 222
 - universal, 66
 - variety of, 49
- algebra left Artinian, 20
- algebra semisimple, 19
- algebra separable, 21
- Aljadeff, 541, 543, 580
- alphabet, 41, 213
- alternating function, 83
- Amitsur, x, 14, 15, 62, 65, 75, 87–89, 92, 93, 123, 191, 208, 210, 222, 265, 284, 287, 289, 290, 292, 299, 300, 309, 310, 376, 382, 383, 395, 542
- Amitsur–Levitzki, ix, 208, 266–268, 329, 332, 537
- antipode, 45
- antisymmetrizer, 170
- Aronhold, 313
- Artin, x, xi, 127, 128, 265, 278, 364, 373, 399, 409
- Auslander, 146
- Azumaya, x, 128, 278

- Baer, 14
- basic
 - algebra, 437

- Beckner, 576, 588
- Belov, 474
- Berele, xii, 213, 228, 424, 474, 477, 482, 537, 542, 543, 588, 593
- Bergman, 405, 420
- Biasco, 578
- big cells, 475
- bimodule, 413
 - free, 413
- block upper-triangular, 418
- Borel subgroup, 174
- Braun, xi, 210, 312, 405, 408, 420
- Burnside, 1
- Capelli polynomial, 55, 69, 198, 199, 208, 228, 273, 285, 405, 430
 - list, 199
- Catalan number, 260
- category, 37
 - cogroup in a, 45
 - coproduct in a, 42
 - final object of a, 40
 - group in a, 45
 - initial object of a, 40
 - opposite, 37
 - product in a, 40
 - product of two, 43
 - small, 38
 - subcategory, 40
- catenary rings, 397
- Cauchy, 85
- Cauchy formula, 85
- Cayley–Hamilton identity, 318, 327
- Cayley–Hamilton theorem, 87
- central character, 373
- centralizer, 8, 155
- centrally admissible, 550
- character, 26, 361
- characteristic Pfaffian, 348
- circle law, 13
- class function, 26
- coaction, 46
- cocharacter, 191
- cocircuit, 476
- codimension, 192
- coding map, 348
- Cohn, ix, 31
- colength, 191
- comultiplication, 45
- conductor, 232, 285
- corner, 183
- counit, 45
- crossed product problem, 382
- cycle, 352
- cyclic shift, 216
- Dahmen–Micchelli, 476
- De Concini, 109
- de Moivre, 563
- degree $d(I)$ of a left ideal, 424
- degree of a simple algebra, 12
- derivation, 23
- descent data, 136
- differentials, 414
- Dilworth, 192
- dimension
 - graded, 223
- dimension of a rational function, 225
- discriminant, 23, 81, 132, 282, 331, 372
- dominance order, 167, 187
- dominant weight, 477
- Donkin, 97, 114, 122, 223, 234, 240, 376, 380
- double tableaux, 177
- double centralizer, 25
- double standard tableaux, 176, 177
- Drensky, 204, 244, 258, 260, 261, 272, 592
- dual group, 494
- Dyson, 571
- element
 - idempotent, 21
 - integral, 393
 - nilpotent, 13
 - quasi-regular, 13
- equivariance, 23
- equivariant maps, 315
- étale topology, 133
- evaluation, 41
 - radical, 436
 - semisimple, 436
- extension, 295
 - central, 17, 295
 - integral, 393
- f.i.r., 415
- faithfully flat descent, 133
- firs, free ideal rings, 415
- Formanek, 265, 266, 270, 336, 364, 424, 432
 - transform, 336
- Fox, 414
- free
 - algebra, 41
 - algebra with trace, 58
 - group, 41
 - monoid, 41
 - objects of a category, 41
- free product, 42
- free ring of traces, 59
- free, associative, monoid, 213
- Frobenius
 - character, 187
 - reciprocity, 28
- full subcategory, 40
- functions
 - asymptotic, 541
- functor
 - adjoint, 43
 - contravariant, 37

- covariant, 37
- forgetful, 38
- representable, 38
- Schur, 172
- fundamental
 - algebra, 435
 - polynomial, 438
 - superalgebra, 516
- G.S. sequence, 598
- Galois, 80, 88
- Gaussian distribution, 557
- Gel'fand–Kirillov dimension, 223
- general linear group, 45
- generalized identities, 68
- generalized polynomial
 - monic, 393
- generic commutative algebra, 51
- generic element, 61
 - algebra of, 62
- generic matrix, 62, 94, 99
 - algebra of, 99
- Giambruno, 192, 334, 405, 417, 418, 427, 447, 541, 542
- GK dimension, 227
- going up, 399
- Goldman, 146
- Golod, xi, 1, 287
- Golod–Shafarevich, 597
- good filtration, 240
- graded identity, 501
- Grassmann
 - algebra, x, 487
 - envelope, x, 506
 - variables, 266, 487
- Grothendieck, 33, 133
- group
 - character, 26
 - invariants, 26
 - linearly reductive, 361
 - rational action, 69
 - torsion, 1
- Haar measure, 27
- Haboush, 364
- height, 575
- height $\text{ht}(P)$, 400
- Hensel ring, 34
- highest weight vector, 174
- Hilbert, x, 360
- Hilbert series, 475
- Hilbert–Poincaré series, 223, 424
- hook k, ℓ , 182
- hook formula, 181
- hook number, 180
- hook-content formula, 341
- ideal
 - annihilator, 310
 - augmentation, 57
 - indecomposable, 421
 - left annihilator, 310
 - lower nil radical, 14
 - nil, 13
 - nil radical, 14
 - nilpotent, 13
 - prime, 16
 - primitive, 12
 - regular, 10
 - right annihilator, 16
 - semiprime, 14
 - verbal, 56
 - verbally prime, 424
- idempotent
 - essential, 170
 - orthogonal, 21
 - primitive, 21
- invariants of matrices, 233
- Irving, 310, 312
- isotypic component, 18
- Jacobson, ix, 9, 21, 311
 - radical, 13
- Janssens, 541, 543, 580
- Jordan–Hölder, 365, 417
- Kaplansky, ix, xi, 2, 11, 269, 270, 287, 291, 307, 373
- Karasik, 541, 543, 580
- Kasparian, 272
- Kemer, x, xi, 191, 210, 312, 405, 420, 429–431, 442, 517
 - index, 431
 - polynomial, 430, 432, 468
 - superindex, 513
 - first, 513
 - second, 514
 - superpolynomial, 515
- Koethe, 14
- Koshlukov, 244
- Kostant, 266, 317
- Krakowski, 488
- Krull, 399
 - dimension, 394
- Kurosh, ix, 1, 221
- Lagrange, 80
- lattice permutation, 187
- Latyshev, 406, 409
- Leron, 195
- Levitzki, 265, 287, 289
- Lewin, 405, 413, 414, 420
- lexicographic order, 213
- Lie, 44
 - bracket, 44
 - monomial, 202
 - polynomial, 202
- linear algebraic group, 35

- Littlewood–Richardson, 85
 - rule, 188
- localization, 30
 - principle, 34, 102
- Lyndon word, 89
- Macdonald, 80
- Magnus, 414
- Mal'cev, 22, 312
- Maschke, 25
- Mehta, 571
- module
 - completely reducible, 9
 - faithfully flat, 126
 - flat, 125
 - irreducible, 9
 - projective, 139
 - projective generators, 140
 - representable, 305
 - residually finite, 305
 - semisimple, 9
 - subdirectly irreducible, 305
- monomial, 174
 - d -good, 193
 - cyclic equivalence, 59
 - primitive, 88
- Morita, 144
- Motzkin number, 260
- multilinear tensors, 174
- multilinearization, 77
- multiplicative set, 30
- Mumford, 364
- Murnaghan–Nakayama rule, 186
- Nagata, 360
- natural transformation, 38
- nil radical, 14
- Noether, Emmy, 28
- Noetherian induction, 29
- noncommutative polynomials, 41
- norm, 324
- Olsson, 488
- orbit space, 133
- order, 152
 - central, 152
- order-symmetric polynomial, 602
- Ore, x , 31
- outer tensor product, 187
- partition, 84
 - column, 169
 - conjugate, 166
 - height, 84
 - hook, 181
 - length, 84
 - row, 169
- partition function, 225
- partitions
 - ideal of, 246
 - Phoenix property, 430, 453
 - PI degree, 292
 - PI equivalence, 195
 - PI exponent, 192, 541
 - Piacentini Cattaneo, 272
 - Pierce
 - decomposition, 435
 - graph, 435
 - Pieri, 85
 - polarization, 52, 76
 - full, 52, 77
 - polynomial
 - μ -fold t -alternating, 431
 - alternating, symmetric, 55
 - antisymmetric, 83
 - central, 270
 - full, 438
 - fundamental, 438
 - multilinear, 52
 - polynomial identity, 2, 46
 - generalized, 67
 - proper, 53
 - stable, 53
 - strong, 205
 - polynomial law, 110
 - polynomial map, 75, 109
 - multiplicative, 112
 - poset, 40
 - Posner, x , 292, 293, 299, 307
 - prime ideal
 - minimal, 29
 - principal bundle, 132, 373
 - Procesi, 61, 62, 98, 109, 128, 278, 317, 364, 384
 - projective linear group, 364
 - proper polynomial, 203
 - Property A, 461
 - Property K, 439
 - quasi-polynomial, 225
 - quotient map, 363
 - quotient variety, 360
 - Révész, 266
 - radical index, 538
 - random variable, 558
 - covariance, 557
 - covariant matrix, 557
 - independent, 557
 - mean, 557
 - variance, 557
 - Raynaud, 33
 - Razmyslov, x , x , 98, 198, 210, 223, 261, 265, 266, 270, 271, 276, 279, 312, 315, 317, 329, 405, 406, 408, 420, 457
 - transform, 255
 - reductive groups, 360
 - Regev, x , 191, 195, 313, 335, 424, 432, 488, 508, 515, 541, 542, 555, 576, 588

- representation, 12
 - n -dimensional, 99
 - induced, 28
 - permutation, 28
 - polynomial, 173
 - rational, 360
 - regular, 25, 28
 - trivial, 26
 - universal n -dimensional, 101
 - variety of semisimple, 364
- representation linear, 25
- restitution, 52, 77
- Reutenauer, 87
- Reynolds operator, 361
- ring of regular functions, 360
- ring of symmetric functions, 85
- Rivlin, 317
- Robbins, 564
- Roby, 109
- Rosset, 266
- Rowen, 408
- Ruffini, 80

- scalar symbols, 352
- Schützenberger, 87
- Schelter, 279, 282, 393
- Schur, 9
 - algebra, 112
 - multiplier, 495
- Sehgal, 334
- Selberg integral, 571
- Shafarevich, xi, 1, 287
- Shirshov, xi, 2, 65, 193, 213–215, 217, 220, 221, 228, 394, 406, 407, 449, 456, 522, 525
 - basis, 216
- sign of a permutation, 55
- simple étale extension, 34
- simply transitive, 283
- slinky, 186
- Small, 310, 312
- Smoktunowicz, 14
- space of symmetric tensors, 110
- Specht, x, xi, 512
 - problem, 429
- special endomorphism, 48
- spectrum, 32
- Spencer, 317
- spline, 476
- staircase tableaux, 184
- standard polynomial, 69
- standard tableau
 - skew, 183
- Stanley, 80
- Stirling's formula, 563
- straightening law, 238
- super tensor product, 493
- superalgebra, 493
 - graded commutative, 493
 - minimal, 554
 - simple, 495
- supercocharacter, 503
- superpolynomial
 - fundamental, 517
- Swan, 266
- symmetric function, 81
 - complete, 81
 - elementary, 81
 - Newton, 82
 - noncommutative, 109
 - Schur, 83, 84
- symmetrizer, 170
- Szigeti, 266

- tableau
 - standard, 167
- Taft, 22
- torsor, 283
- torus, 360
- trace
 - codimension, 555
 - form, 23
 - formal, 56
 - identities, 61, 316
 - reduced, 161
- Tuza, 266

- unique factorization, 420
- universal fundamental algebra, 484
- unramified locus, 389

- Vaccarino, 109
- Valenti, 334
- Vandermonde, 47, 83
- Vapne, 195
- variable
 - radical, 436
 - semisimple, 436
- variety
 - of algebras with trace, 61
 - verbally prime, 533
- variety of algebras
 - minimal, 553
- virtual
 - codimension, 573
 - exponent, 573

- Wagner identity, 254, 261
- weak identity, 272
- Wedderburn, 11, 21, 23, 435
- weight, 215
 - vector, 174
- Weyl's dimension formula, 180
- word, 41, 176, 213
 - d -decomposable, 214
 - length, 88
 - Lyndon, 92
 - period of, 216

- periodicity of, 216
- primitive, 216
- Yoneda, 38, 40, 45, 106, 283
- Young tableau, 167
 - content, 168
 - semistandard, 168
 - shape, 167
 - skew, 168
 - standard, 167
- Young diagram, 166, 169
 - skew, 167
- Young symmetrizer, 169, 170
- Young–Frobenius, 180
- Zaicev, 192, 405, 417, 418, 427, 447, 541, 542
- Zariski, 86
 - topology, 32, 294
- Zelmanov, 2
- Ziplies, 109
- zonotope, 476
- Zorn, 13, 17, 28
- Zubrilin, 109, 405, 457

Index of Symbols

- $td_n(M_k(F))$, 557
 $T_X(m)$, 56
 $T_\sigma(x_1, x_2, \dots, x_m)$, 56
 $T_n(m)$, 318
 $\mathcal{T}_X(X)$, 56
 $\text{Tid}(R)$, 57
 $\psi_\sigma(x_1, x_2, \dots, x_m)$, 56
 $A\langle X \rangle$, 37
 $A\langle x_{ij}^{(k)} \rangle$, 68
 $A_+\langle X \rangle$, 38
 $B *_A C$, 38
 $E_{k,n}$, 359
 $F[G]$, 21
 $F_{A,h,n}^{(1)}(Y_1, \dots, Y_h, Z_1, \dots, Z_h)$, 518
 $G(A)$, 508
 $GL(V)$, 21
 $GL(n, K)$, ix
 $GL_\infty(F)$, 49
 $H(k, \ell)$, 181
 I^* , 507
 $I_1 \sim_T I_2$, 43
 $M_{k,l}$, 498
 $N(R)$, 10
 $\text{Nat}(F, G)$, 34
 $P_k(n)$, 562
 R^e , 145
 R^{op} , 145
 R_S , 27
 R_T , 53
 $R_V\langle X \rangle$, 64
 $R_{n,k}$, 94
 $S(V^*)$, 31
 S_λ , 82
 Sets , 34
 $\text{Spec}(A)$, 29
 St_h , 66
 T_+ , 42
 $Td_n(M_k(F))$, 557
 $UT(d_1, d_2, \dots, d_m)$, 420
 V^G , 22
 V_G , 22
 $V_n = F[S_n]$, 175
 $V_{a,b}$, 505
 $W(X)$, 37
 W_0 , 87
 W_p , 87
 $[R, R]$, 53
 $\Delta(e_1, \dots, e_n)$, 79
 $X \downarrow_{S_{n-1}}$, 183
 $X_\rho(g)$, 22
 $\ell(w)$, 87
 ϵ_σ , 51
 $\text{hom}_C(A, B)$, 33
 $\lambda \vdash n$, 82
 λ_n , 565
 $\mathbb{A}_F^d(R)$, 118
 \mathbb{S} , 88
 $\mathbb{Z}[e_1, \dots, e_n]$, 79
 \mathcal{A}_s , 488
 \mathcal{A}_{s_A} , 439
 C^{op} , 33
 $\mathcal{F}_T(X)$, 55
 \mathcal{F}_d , 114
 $\mathcal{F}_{\bar{A},s}$, 487
 $\mathcal{N}(R)$, 10
 $\mathcal{O}(G)$, 31
 $\mathcal{P}^{3,odd}$, 236
 $\mathcal{P}_A(N, M)$, 108
 $\mathcal{R}_R^n(B)$, 97
 $S(X)$, 116
 $S_X := \mathbb{Z}[\sigma_i(w)]$, 88
 $\mathcal{T}_A^{su}(X)$, 523
 $\mathcal{T}_A(X)$, 450
 \mathcal{T}_X , 55
 $\mathcal{T}_X(R)$, 57
 $\mathcal{T}_X(m)$, 56
 $\mathcal{T}_n(m)$, 315
 \mathcal{V}^* , 509
 $\text{Id}_X(R)$, 42
 ψ_k , 79
 \sim_{T_2} , 504
 \sqrt{I} , 10
 \tilde{V}_m , 233
 ξ_α , 57
 $a \star b$, 580
 f_λ , 180

$f^{h_1, \dots, h_d}(v_1, \dots, v_d)$, 74

$h(k, l, t)$, 548

$ht(\lambda)$, 82

$ob(C)$, 33

$t(\mathbb{R})$, 53

$t^h := t_1^{h_1} \dots t_d^{h_d}$, 75

$z[d]$, 92

$\mathcal{T}_{n,k}$, 94

$a(\alpha, e)$, 580

$\mathcal{R}_{n,k}^{(d)}$, 95

$\mathcal{T}_{n,k}^{(d)}$, 95

$J(\mathbb{R})$, 9