

Index of Notation

- $(j_0 \dots j_n)$, 12
 A^G , 2
 A_i , 4
 $C_d(n)$, 145
 $D(f)$, 36
 E^* , 6
 $G = \mathrm{SL}(V)$, 4
 G_x , 98
 $K = \mathrm{SU}(n)$, 32
 $L(\lambda)$, 76
 L_D , 48
 P_n^m , 174
 $R(D)$, 48
 R, R_+, R_- , 74
 $R^*(D)$, 48
 R_n^m, P_n^m , 174
 $S^m(E^*)$, 4
 U_α, U^+, U^- , 74
 $V(I)$, 32, 36
 V_x , 76
 $X(K)$, 36
 $X//G, X/G$, 92
 $X^{\mathrm{ss}}(L), X^s(L), X^{\mathrm{us}}(L)$, 115
 X_Σ , 192
 $X_{r,n}$, 165
 X_{reg} , 99
 $X_{r^m,n}^{\mathrm{ss}}, X_{r^m,n}^s, P_{r,n}^m$, 169
 $Z_{\mathrm{alg}}^1, B_{\mathrm{alg}}^1, H_{\mathrm{alg}}^1$, 106
 $[i_1, \dots, i_r]$, 13
 $[j_0, \dots, j_n]$, 12
 $[m]$, 5
 $\mathrm{Cov}(G; A, W)$, 70
 $\mathrm{Cov}(V)_{m,p}(d)$, 66
 $\Delta(G)$, 140
 $\mathrm{GL}_n(k)$, 2
 $\mathrm{GL}_{n,k}, \mathrm{SL}_{n,k}$, 36
 $\Gamma(X, L)$, 103
 $\mathrm{Gr}(r, m)$, 21
 $\mathrm{Gr}_{r,n}$, 165
 $\mathrm{Hyp}_d(n)$, 145
 $\Lambda(r, m)$, 21
 $\Lambda(x)$, 140
 Mat_n , 2
 Ω , 17
 $\mathrm{O}_r(k)$, 28
 $\mathrm{Pic}^G(X)$, 105
 $\mathrm{Pol}(E)$, 4
 $\mathrm{Pol}(\mathrm{Pol}_d(V))$, 4
 $\mathrm{Pol}_m(E)$, 3, 5
 $\mathrm{Projm}(A)$, 38
 $\mathrm{SL}_n(\mathbb{C})$, 32
 $\mathrm{SL}_r(k)$, 13
 $\Sigma(n, m)$, 201
 Σ_m , 6
 Σ_r , 17
 $\mathrm{Spec}(A)$, 2
 $\mathrm{Spm}(A)$, 35
 $\mathrm{Sym}_m(E)$, 6

216

INDEX

- $\text{Wt}(\rho)$, 73
 av , 33
 \mathbb{A}^N , xi
 $\mathbb{G}_{a,k}, \mathbb{G}_{m,k}$, 36
 $\mathbb{P}(V)$, xi, 14
 $\mathbb{P}(q_1, \dots, q_n)$, 125
 \mathbb{P}^n , 40
 $\mathbb{V}(L)$, 103
 $\mathcal{N}(G; V)$, 117
 $\mathcal{O}(X)$, 35
 $\mathcal{X}(G)$, 106
 $\mathcal{X}(G)^*$, 130
 $\mathcal{X}(T)^*$, 77
 \det , 79
 \det_J , 12
 \mathcal{D}_r , 12
 $\epsilon(I_1, \dots, I_k)$, 19
 $\epsilon(\sigma)$, 18
 $\mathfrak{sl}_n(\mathbb{C})$, 33
 $\mu^L(x, \lambda)$, 143
 μ_τ , 13
 μ_n , 39
 $\mathcal{O}(x)$, 98
 $\text{pol}(P)$, 5
 $\text{res}(F)$, 5
 $\text{wt}(V), \overline{\text{wt}(V)}$, 135
 $\text{wt}(x), \overline{\text{wt}(x)}$, 136
 $\text{symb}(F)$, 9
 τ , 13
 $\text{Tab}_{r,m}(w)$, 20
 $\text{Tab}_{r,m}(w)_{\text{hom}}$, 20
 $\text{Spm}(A)$, 2
 \tilde{P} , 17
 a_i , 4
 $k(X)$, 47
 $k[X]$, 35
 $k[\Lambda(r, m)]$, 21
 $k[\mathcal{M}]$, 189
 $p_w(m, d)$, 81
 $p_{i_1 \dots i_r}$, 21
 v_d , 83

Index

- absolute invariant, 150, 155, 161
- action
 - faithful, 89
 - linearizable, 124
 - rational, 37
 - regular, 37
- additive group, 36, 56, 62, 101
- adjugate matrix, 18
- affine algebraic group, 35
- affine cone, 117, 131
- algebra
 - of covariants, 70
 - of invariants, 2
- algebraic group
 - diagonalizable, 143
 - exceptional type, 42
 - geometrically reductive, 42
 - linear, 37
 - linear reductive, 42
 - reductive, 42
 - semisimple, 42
 - simple, 42
- algebraic torus, 42
- algebraic variety
 - abstract, 118
 - affine, 35
 - complete, 132
 - projective, 40
 - proper, 132
 - quasi-affine, 50
 - quasi-projective, 40
- ample, 103
- very, 103
- ampleness criterion, 116
- apolar, 15
- association isomorphism, 181
- averaging operator, 30, 71
- base-point-free
 - line bundle, 103
 - linear system, 111
- binary form, 4
- bracket function, 12, 23
- Capelli identity, 28
- catalecticant, 10, 13, 15, 28, 150
- catalecticant invariant, 15
- catalecticant matrix, 15
- Cayley Ω -process, 27
- Cayley operator, 17
- Cayley-Sylvester formula, 82
- chamber, 174
- Chevalley's criterion, 100
- Chow variety, 100
- Clebsch-Gordan decomposition, 90
- closed embedding, 40
- coaction homomorphism, 37
- cocycle, 104
- combinant, 69, 87

- complete reducibility, 70
- concomitant, 69
- contravariant, 69
- convex polyhedral cone, 188
- coordinate algebra, 35
- covariant, 66
 - of an action, 69
 - degree of, 66
 - order of, 66
- cross-ratio, 88, 162, 176
- diagonal action, 65
- discriminant, 9, 14, 15, 26, 28, 68, 146, 147, 149, 150, 152, 154, 161, 163
- equivalence relation, 91
- equivariant function, 1
- exceptional curve, 177
- fan, 191
 - N -fan, 191
 - complete, 193
 - simplicial, 192
- flag complex, 140
- flip, 127, 174
- Fundamental Theorem
 - First, 20, 67
 - Second, 24
- G -variety, 92
- general points, 61
- geometric grading, 38
- gluing construction, 117
- gluing data, 117
- good \mathbb{G}_m -action, 38
- Gordan–Hilbert Theorem, 30
- group scheme, 98
- Haboush’s Theorem, 42
- Halphen pencil, 59
- Hankel determinant, 10
- Hermite Reciprocity, 82
- Hesse form, 88
- Hessian, 68, 88
- highest weight, 76
- highest weight module, 76
- highest weight vector, 76
- Hilbert’s Problem 14, 47
- Hilbert–Mumford criterion, 129
- homogeneous localization, 40
- hook formula, 86
- hypersimplex, 173
- hypersurface, 145
- Igusa quartic hypersurface, 181
- inflection point, 56
- invariant function, 1
- isogeneous, 42
- isotropy subgroup, 98
- Jacobian, 69
- Kempf-stable, 141
- Laplace formula, 19
- Laurent monomial, 73
- Lefschetz Theorem, 109
- line G -bundle, 104
 - G -effective, 127
- linear algebraic groups, 37
- linearization, 104
 - democratic, 169
 - trivial, 105
- module of covariants, 70
- moment map, 142
- multi-degree, 8, 11
- multi-weight, 11

INDEX

219

- multihomogeneous, 11
- multiisobaric, 11
- multiplicity, 55, 72
- Nagata Theorem, 41
- Nagata's conjecture, 61
- Nagata's counterexample, 52
- normal ring, 45
- null-cone, xi, 32, 117, 120
- observable subgroup, 50
- omega-operator, 17
- one-parameter subgroup
 - adapted, 140
 - destabilizing, 138
 - most responsible for instability, 140
 - of a torus, 77
 - of an algebraic group, 129
- order
 - of concomitant, 69
 - of contravariant, 69
- parabolic subgroup, 50
- Plücker equations, 24
- plethysm decomposition, 81
- point
 - K -point, 36
- polar hypersurface, 14
- polarization, 5
- polarization map, 6
- projective invariant, 46
- projective space, 39
- projective spectrum, 38
- proper map, 132
- quadratic form, 4
- quantic, 87
- quotient
 - categorical, 92
 - geometric, 92
 - good categorical, 94
 - good geometric, 92
- radical, 42
- rank, 74
- rational action
 - on an algebra, 37
- rational character
 - of a torus, 73
 - of an algebraic group, 106
- rational convex polyhedral cone, 188
- rational quotient, 100
- rational representation, 37, 73
- reductive algebraic group, 42
- regular action, 37
- regular function, 35
- restitution, 5
- resultant, 69
- Reynolds operator, 71
- ring of invariants, 2
- ringed space, 118
- root, 73
 - dual, 77
 - negative, 74
 - positive, 74
 - simple, 74
- Schrödinger representation, 142
- Schur multipliers, 108
- Segre cubic primal, 180
- Segre quartic primal, 181
- self-association involution, 181
- semi-stable, 115
- semiinvariant, 65
- skeleton, 199
- small resolution, 126

- solvable algebraic group, 42
- stabilizer, 41
- stable, 115
 - properly, 116
- straightening law, 23
- structure sheaf, 118
- symbolic expression, 9
- tableau, 12
 - degree, 12
 - homogeneous, 12
 - rectangular, 12
 - standard, 22
- tableau function, 13
 - homogeneous, 13
- ternary cubic, 153
- theta group, 141
- Tits conjecture, 140
- toric variety, 192
- transvectant, 68
- transversal, 171
- unitary trick, 32
- unstable, 115
- valuative criterion
 - of properness, 132
 - of separatedness, 132
- variation of quotients, 143
- Veronese embedding, 121
- Veronese map, 83, 111
- Veronese variety, 83
- Weierstrass equation, 154
- weight, 30, 46, 67
 - dominant, 76, 78
 - fundamental, 78
 - in a representation, 73
 - of covariant, 67
- weight polytope
 - of a point, 136
 - of the representation, 135
- weight set, 136
- weight space, 135
- weighted projective
 - linearization, 196
 - space, 39, 180
- Weitzenböck's Theorem, 51
- Weyl group, 138
- Young diagram, 86
- Zariski's problem, 49