

---

# Index

- $(S^d V)_0$ , 79
- 1-graph, 8
- $G$ -structure, 241–248
  - 1-flat, 250
  - 2-flat, 253
  - curvature, 252, 254
  - definition, 247
  - flat, 248
  - prolongation, 254
- $G(k, V)$ , 28
- $G/H$ -structure of order two, 273
- $I$ , vector subbundle spanned by 1-forms
  - of  $\mathcal{I}$ , 10
- $I^k$ , vector subbundle spanned  $k$ -forms
  - of  $\mathcal{I}$ , 10
- $K(E)$ , 79
- $M_{N \times N}$ , 19
- $R$ : Riemann curvature, 69
- $S^k V$ , 384
- $TM$ , tangent bundle, 405
- $T^*M$ , cotangent bundle, 405
- $T_x M$ , tangent space, 405
- $\Gamma_{\alpha, i}^\beta$ , 256
- $\Lambda^k V$ , 384
- $\mathcal{E}$ , 322
- $\mathcal{Q}$ , 31
- $\mathcal{S}$ , 31
- $\mathcal{T}$  tractor bundle, 327
- $II$ , Euclidean second fundamental form, 50
- $II$ , projective second fundamental form, 97
- $|II_{M, x}|$ , 100
- $III$ , projective third fundamental form, 333
- $III^v$ , 348
- $\mathbb{L}^{n+1}$ , 80
- $\Gamma(E)$ , smooth sections of  $E$ , 405
- $\Delta r_{\alpha\beta\gamma}^\mu$ , 333
- $\Lambda^2 V$ , 383
- $\Xi_A$ , characteristic variety of a tableau, 130
- $\Omega^k(M), \Omega^*(M)$ , 406
- $\Omega^k(M, V)$ , 408
- $\Omega^{(p, q)}(M)$ , 413
- $\delta_\sigma(X)$ , secant defect, 347
- $\delta_\tau(X)$ , tangential defect, 347
- $\delta_*$ , dual defect, 342
- $\phi^*$ , pullback by  $\phi$ , 406
- $\phi_*$ , pushforward by  $\phi$ , 407
- $\kappa_g$ , 54
- $\kappa_n$ , 56
- $\tau(X)$ , tangential variety, 106
- $\tau(Y, X)$ , 350
- $\tau_g$ , 56
- $ASO(2)$ , 13
- $ASO(3)$ , 25
  - as space of frames, 25
- $\text{Ann}(v)$ , 348
- $A^{(1)}$ , 119
- $A^{(l)}$ , 119
- $\text{Baseloc} | II_{M, x} |$ , 100
- $Cl(V, Q)$ , 402
- $C^\infty(M)$ , 405
- $\text{End}(V)$ , 382

- $E_6$ , exceptional Lie group, 351  
 $E_7$ , exceptional Lie group, 353  
 $\mathbb{E}^3$ , Euclidean three-space, 2  
 $\mathbb{F}\mathbb{F}^k$ , 335  
 $|\mathbb{F}\mathbb{F}^k|$ , 335  
 $F_4$ , differential invariant, 356  
 $F_4$ , exceptional Lie group, 351  
 $F_k$ , 357  
 $\mathcal{F}(M)$ , 65  
 $\mathcal{F}^1$   
     Euclidean, 41  
     projective, 97  
 $GL(V)$ , 386  
 $G(n, m)$ , 170  
 $G(k, V)$ , Grassmannian, 28  
 $G_2$ , exceptional Lie group, 394  
 $Gr(k, V)$ , orthogonal Grassmannian, 89  
 $\mathbf{G}(n, T\Sigma)$ , 149  
 $\text{Hol}_u^\theta$ , 263  
 $\text{Hom}(V, W)$ , 382  
 $H^{0,2}(A)$ , 148  
 $H^{i,j}(A)$ , 152  
 $\mathcal{H}^{i,j}(\mathfrak{g})$ , 259  
 $(I, J)$ , linear Pfaffian system, 135  
 $\mathcal{I}^k$ ,  $k$ -th homogeneous component of  $\mathcal{I}$ ,  
     10  
 $\mathcal{I}^{(1)}$ , derived system, 188  
 $\mathcal{I}$ , differential ideal, 10  
 $J(Y, Z)$ , join of varieties, 106  
 $\mathcal{L}_X$ , Lie derivative, 408  
 $O(V, Q)$ , orthogonal group, 387  
 $SL(V)$ ,  $SL_n$ , special linear group, 387  
 $SO(V, Q)$ , special orthogonal group, 387  
 $SU(n)$ , special unitary group, 389  
 $S^2V$ , 383  
 Singloc  $|II_{M,x}|$ , 100  
 $Sp(V, \omega)$ , symplectic group, 387  
 $\mathbb{S}_m$ , spinor variety, 355  
 $\mathbb{T}(V)$ , 247  
 $T_x^*M$ , cotangent space, 405  
 $U(n)$ , unitary group, 389  
 $V_{\mathbb{C}}$ , complexification of  $V$ , 411  
 $X_{\text{smooth}}$ , 102  
 $[TH_\theta]$ , 254  
 $c_k$ , codimension of polar space, 229  
 $\det_{\mathbb{A}}$ , 351  
 $\det$ , 385  
 $\underline{d}^k$ , 335  
 $d$ , exterior derivative, 407  
 $\mathfrak{g}$ , Lie algebra of Lie group  $G$ , 18  
 $\mathfrak{m}_x$ , functions vanishing at  $x$ , 405  
 $(p, q)$ -forms, 413  
 $s_k$   
     characters of a tableau, 127  
     characters of an EDS, 231  
 $[X, Y]$ , 406  
 $\mathfrak{b}$ , 69  
 $\lrcorner$ , interior product, 385  
 $\nabla$ , 256  
 $\otimes$ , tensor product, 382  
 $\{ \}$ , linear span, 11  
 $\{ \}_{\text{alg}}$ , 11  
 $\{ \}_{\text{diff}}$ , 11  
 $\sharp$ , 69  
 $\square$ , Kulkarni-Nomizu product, 85  
 $e$ -structure, 280  
  
 abuse of notation, 33, 96, 142  
 adjoint representation, 391  
     of Lie algebra, 390  
 affine connection, 260  
 affine tangent space, 96  
 algebraic variety, 102  
     degree of, 102  
     dimension of, 102  
     general point of, 102  
     ideal of, 102  
 almost complex manifold, 247, 251, 412  
 almost complex structure, 412  
 almost Einstein, 328  
 almost scalar constant, 328  
 almost symplectic manifold, 247  
 Ambrose-Singer Theorem, 265  
 apparent torsion, 137  
 arclength parameter, 15  
 associated hypersurface, 366  
 associated varieties, 365  
 associative submanifolds, 173, 238  
 associator, 396  
 asymptotic directions, 100  
 asymptotic line, 56, 199, 211  
  
 Bäcklund transformations, 208–213, 304  
 Bäcklund's Theorem, 211  
 basic differential form, 409  
 Bertini Theorem, 361  
     higher-order, 361  
 Bertrand curve, 28  
 Bezout's Theorem, 102  
 Bianchi identity  
     first, 252  
     first, 77  
     second, 80

- Bonnet surface, 48, 204  
 Born-Infeld system, 305  
 Burger's equation, 180, 205  
 calibrated submanifold, 171  
 calibration, 169
  - associative, 173
  - Cayley form, 174
  - coassociative, 174
  - special Lagrangian, 172
 canonical system
  - on Grassmann bundle, 149
  - on space of jets, 33
 Cartan
  - five variables paper, 177, 189
 Cartan geometry, 273  
 Cartan integer, 128, 151  
 Cartan Lemma, 385  
 Cartan system, 182  
 Cartan's algorithm for linear Pfaffian systems, 150  
 Cartan's Test, 229  
 Cartan-Dieudonné Theorem, 401  
 Cartan-Hadamard theorem, 79  
 Cartan-Janet Theorem, 164  
 Cartan-Kähler Theorem, 226–229
  - for linear Pfaffian systems, 148
  - for tableaux, 128
  - Goldschmidt version, 153
 catenoid, 47  
 Cauchy characteristics, 177
  - quotient by, 183
 Cauchy problem, 419  
 Cauchy-Kowalevski form, 420  
 Cauchy-Kowalevski Theorem, 215, 421  
 Cauchy-Riemann equations, 415
  - tableau, 116, 128
 Cayley plane, 352  
 Cayley submanifold, 174  
 character of a tableau, 128  
 characteristic hyperplane, 153  
 characteristic systems (Monge), 185  
 characteristic variety, 129
  - dimension and degree of, 131
 characteristics
  - Cauchy, 177, 231
  - confounded, 186
  - first-order, 186
  - method of, 179–181
  - Monge, 186, 287
 characters, 231
  - of linear Pfaffian system, 151
  - of tableau, 127
 Chebyshev net, 200  
 Christoffel symbols, 256  
 Clifford algebras, 402
  - fundamental lemma of, 402
 Clifford torus, 82  
 co-roots, 400  
 coassociative submanifold, 174  
 Codazzi equation
  - for Darboux frames, 46
  - matrix form, 54
 codimension, 217  
 coisotropic hypersurface, 366  
 cominuscule variety, 353  
 complete intersection, 378  
 complex characteristic variety, 130  
 complex contact structure, 416  
 complex manifold, 411, 412  
 complex structure, 388, 412  
 complexification
  - of a real vector space, 388
 cone, 48
  - characterization of, 367
  - over a variety, 106
 conformal Killing vector field, 319  
 conformal Laplacian, 324  
 conformally flat, 93  
 connection
  - affine, 260
  - on coframe bundle, 248–254
  - on induced vector bundles, 258
  - on vector bundle, 256
  - symmetric, 259
  - torsion free, 72
 connection form, 66, 249  
 conormal space, of submanifold in  $\mathbb{P}^N$ , 96  
 contact manifold, 38  
 contact system
  - on space of jets, 33
 contact, order of, 103  
 cotangent
  - bundle, 405
  - space, 405
 Cotton-York tensor, 316, 318  
 covariant derivative
  - definition of, 70
 covariant differential operator, 256  
 cubic form, 332  
 curvature
  - Gauss, 42

- geometric interpretation of, 51
  - in coordinates, 4
- mean, 42
  - geometric interpretation of, 63
  - in coordinates, 4
- of  $G$ -structure, 252
- of curve in  $\mathbb{E}^2$ , 15
- of curve in  $\mathbb{E}^3$ , 27
- Ricci, 79, 235
- scalar, 79, 235, 239
- sectional, 79
- curvature-line coordinates, 160
- curve
  - arclength parameter, 15
  - Bertrand, 28
  - regular, 14
  - speed of, 15
- curve in  $\mathbb{E}^2$ 
  - curvature, 15
  - osculating circle, 16
- curve in  $\mathbb{E}^3$ 
  - curvature, 27
  - differential invariants, 26–28
  - torsion, 27
- cylinder, 48
- Darboux
  - method of, 190–195
- Darboux frame, 46
- Darboux semi-integrable, 194, 197
- Darboux's Theorem, 36
- Darboux-integrable, 190, 212
  - decomposable EDS, 289
  - Goursat-Vessiot classification, 194, 286
- de Rham Splitting Theorem, 265
- decomposable EDS, 287
- decomposable tensor, 382
- derived flag, 188
- derived system, 188
- determinant
  - of linear endomorphism, 385
- developable surface, 44
- differential form, 406
  - basic, semi-basic, 409
  - closed, 408
  - homogeneous, 10
  - left-invariant, 18
  - vector-valued, 408
- differential ideal, 10
- differential invariant
  - Euclidean, 3
- dual basis, 381
- dual variety, 107, 341
  - defect of, 342
  - reflexivity, 342
- dual vector space, 381
- Dupin
  - cyclides of, 431
  - theorem of, 225
- Einstein
  - almost, 328
- Einstein manifold, 82
- Einstein metric
  - in conformal class, 310
- embedded tangent space, 96
- Engel structure, 189
- equivalent
  - $G$ -structures, 248
  - webs, 242
- Euclidean group, 25
- Euler characteristic, 58
- exceptional group
  - $E_6$ , 351
  - $E_7$ , 353
  - $F_4$ , 351
- exterior algebra, 401
- exterior derivative, 407–408
- exterior differential system, 34
  - decomposable, 287
  - hyperbolic, 187–188, 286
  - linear Pfaffian, 136
  - Pfaffian, 11
  - symmetries, 176–177
  - with independence condition, 31
- face of calibration, 171
- first Bianchi identity, 77
- first fundamental form (Riemannian), 50
- first-order adapted frames (Euclidean), 49
- flag
  - $A$ -generic, 127
  - complete, 105
  - partial, 105
- flag variety, 105
- flat
  - $G$ -structure, 248
  - 3-web, 242
  - path geometry, 272
  - Riemannian manifold, 69
  - isometric immersions of, 166

- surface, 45
- flow of a vector field, 6
- flowbox coordinates, 6
- flowchart for Cartan's algorithm, 150
- focal hypersurface, 109
- focal surface, 210, 239
- frame
  - Darboux, 46
- frame bundle
  - general, 65
  - orthonormal, 66
- Frenet equations, 27
- Frobenius ideal, 11, 13
- Frobenius system
  - tableau of, 118
- Frobenius Theorem, 11–13, 34
  - proof, 34
- Fubini cubic form, 332
- Fubini forms, 332, 356
- Fulton-Hansen Theorem, 349
- fundamental form
  - $k$ -th, 335
  - effective calculation of, 335
  - prolongation property of, 334
  - via spectral sequences, 336
- fundamental lemma
  - for general frames, 73
- Gauss curvature
  - geometric interpretation of, 51
  - in coordinates, 4
  - via frames, 40–42
- Gauss equation, 52
- Gauss image, 97
  - characterization of, 371
- Gauss map
  - algebraic, 75
  - Euclidean, 50
  - projective, 97
  - varieties with degenerate, 109
- Gauss' theorema egregium, 53
- Gauss-Bonnet formula, 60
- Gauss-Bonnet Theorem, 58
  - for compact hypersurfaces, 74
  - local, 56
- Gauss-Bonnet-Chern Theorem, 74
- general point, 102
- generalized Monge system, 377
- generic point, 102
- geodesic, 54
  - of affine connection, 260
- geodesic curvature, 54
- geodesic disk, 56
- geodesic torsion, 56
- Goursat-Vessiot classification, 194, 286
- Grassmann bundle, 149
  - canonical system on, 149
- Grassmannian, 28
  - isotropic, 104
  - tangent space of, 29
- half-spin representation, 356
- Hartshorne's conjecture, 378
- heat equation, 420
- helicoid, 43
- Hermitian form, 389
- Hermitian inner product, 389
- hexagonality, 245
- higher associated hypersurface, 366
- holomorphic map, 413
- holonomy, 262–271
- holonomy bundle, 263
- holonomy group, 263
- homogeneous Riemannian manifold, 90
- homogeneous space, 16
- Hopf conjecture, 80
- Hopf differential, 203
- Hopf fibration, 91
- horizontal curve, 262
- horizontal lift, 262
- hyperbolic EDS, 187–188, 286
- hyperbolic space, 80
  - isometric immersions of, 169
- hyperplane section of a variety, 108
- hypersurfaces in  $\mathbb{E}^N$ 
  - fundamental theorem for, 76
- ideal
  - algebraic, 10
  - differential, 10
  - Frobenius, 11, 13
- incidence correspondence, 108
- independence condition, 31
- index of a vector field, 57
- index of relative nullity, 100
- induced representation, 392
- induced vector bundle, 257
- initial data, 419
- initial value problem, 419
- integrable extension, 204–208, 286, 290
  - via conservation law, 206
- integral
  - intermediate/general, 191
- integral curve, 5

- integral element, 31
  - Kähler-ordinary, 217
  - Kähler-regular, 221
  - ordinary, 229
- integral manifold, 31, 34
- interior product, 385
- inversion in sphere, 320
- involutive
  - integral element, 229
  - linear Pfaffian system, 149
  - tableau, 127
- isometric embedding, 141–145
- isothermal coordinates, 93
  - existence of, 157
- isotropic Grassmannian, 104
- isotropy representation, 17
  
- Jacobi identity, 390
- jets, 32
- join of varieties, 106
  
- Kähler manifold, 171
- KdV equation, 207, 209
  - prolongation algebra, 208
- Killing form, 393
- Killing vector field, 86
- Kulkarni-Nomizu product, 85
  
- Laplace system
  - tableau for, 129
- Laplace's equation, 196
- Laplacian, 92
  - conformal, 324
- Lawson conjecture, 82
- left action, 16
- left-invariant
  - differential form, 18
  - vector field, 18, 391
- level, 127
- Lie algebra, 390
  - of a Lie group, 18
  - semi-simple, 397
  - simple, 397
- Lie bracket, 406
- Lie derivative, 408
- Lie group, 386
  - action, 299–300
  - exponential map, 299
  - linear representation of, 386
  - matrix, 19, 386–388
- lift, 8, 17
  - first-order adapted, 40
- line congruence, 210
- line of curvature, 56, 225
  - isothermal coordinates along, 160
- linear map, 381
  - transpose/adjoint of, 382
- linear normality
  - Zak's theorem on, 346
- linear Pfaffian systems, 136
  - Cartan's algorithm for, 150
  - involutive, 149
- linear projection of variety, 108
- linear syzygy, 359
- Liouville's equation, 190–191, 210, 305
- locally ruled variety, 109
- locally symmetric manifold, 267
  
- majorants, 122
- manifold
  - contact, 38
  - locally symmetric, 267
  - restraining, 228
  - symplectic, 36
- matrix Lie groups, 386–388
- Maurer-Cartan equation, 20
- Maurer-Cartan form, 18
  - of a matrix Lie group, 19
- maximal torus, 398
- mean curvature
  - geometric interpretation of, 63
  - in coordinates, 4
  - via frames, 40–42
- mean curvature vector, 64
- metric
  - conformally flat, 93
- minimal hypersurfaces, 239
- minimal submanifold, 169
- minimal surface, 63, 201–202
  - Riemannian metric of, 158
- minimizing submanifold, 169
- Minkowski space, 80
- modified KdV equation, 207
- Monge's method, 197
- Monge-Ampère
  - equation, 195
  - system, 196
- Monge-integrable, 197, 286
- moving frame, 4
  - adapted, 13
- multilinear, 382
- multiplicity of intersection, 103
- musical isomorphism, 69
- Myers' Theorem, 79

- Newlander-Nirenberg Theorem, 413  
 Nijenhuis tensor, 414  
 noncharacteristic initial data, 129  
 nondegenerate quadratic form, 392  
 normal bundle, 50, 61  
 normal curvature, 56  
 normal space, of submanifold in  $\mathbb{P}^N$ , 96  
  
 octonions, 395–396  
 orthogonal Grassmannian, 89  
 orthogonal group, 387  
 orthogonal involutive Lie algebra, 268  
 osculating circle, 16  
 osculating hypersurface, 358, 360  
 osculating quadric hypersurface, 358  
  
 parabolic group, 312  
 parabolic subgroup, 103, 353  
 parallel surfaces, 198  
 parallel transport, 262  
 path geometry, 271–284  
   definition of, 272, 274  
   dual, 273  
   flat, 272  
 Pfaff rank, 37  
 Pfaff's Theorem, 37  
 Pfaffian, 392  
 Pfaffian system, 11  
   linear, 136  
 Picard's Theorem, 5, 10  
 Pieri rule, 84  
 Poincaré-Hopf Theorem, 58  
 point transformation, 271  
 polar spaces, 218–220  
 principal curvatures, 42  
 principal framing, 46  
 principal symbol, 117  
 projective differential invariants  
   in coordinates, 357  
 projective second fundamental form, 97  
   coordinate description of, 101  
   frame definition of, 99  
 projective structure, 260  
 prolongation, 119, 149, 187, 193  
   of a  $G$ -structure, 254  
 prolongation property, 334  
   strict, 354  
 prolongation structures, 206  
 pseudospherical surfaces, 199–201  
   Bäcklund transformation, 210  
   of revolution, 200  
 pullback, 406  
  
 pushforward, 407  
  
 rank  
   of a Lie algebra, 398  
   of a Pfaffian system, 11  
   of a tensor, 383  
 rational homogeneous variety, 103  
 reduction  
   of frame bundle, 248  
 reductive  
   Lie group/Lie algebra, 397  
 refined third fundamental form, 348  
 regular curve, 14  
 regular second-order PDE, 146  
 relative tangent star, 350  
 representation  
   induced, 392  
   isotropy, 17  
   of Lie algebra, 390  
   of Lie group, 386  
 restraining manifold, 228  
 retracting space, 182  
 Ricci curvature, 79, 235  
 Riemann curvature tensor, 68–69  
 Riemann invariant, 190  
 Riemann surface, 414  
 Riemannian geometry, 246  
   fundamental lemma, 67–68  
 Riemannian manifold, 52  
   flat, 69  
   homogeneous, 90  
 Riemannian metric, 50, 52  
 right  $G$ -bundle, 247  
 right action, 16  
 root, 399  
 root system, 399  
 ruled surface, 45  
 ruled variety, 339  
  
 scalar curvature, 79, 235, 239  
 Schouten tensor, 85  
 Schur's Lemma, 387  
 Schwarzian derivative, 23  
 secant defect, 348  
 secant variety, 106  
 second Bianchi identity, 80  
   for a  $G$ -structure, 268  
 second fundamental form  
   base locus of, 100  
   Euclidean, 50  
   projective, 97  
   singular locus of, 100

- second-order PDE
  - characteristic variety, 154
  - classical notation, 146
  - tableau, 147
- section
  - of vector bundle, 405
- sectional curvature, 79
- Segre product of varieties, 104
  - fundamental forms of, 339
- Segre variety, 104, 131
  - fundamental forms of, 338
- semi-basic form, 409
- semi-Riemannian manifold, 247
- semi-simple Lie algebra, 397
- Severi variety, 350, 352
  - fundamental form of, 352
  - Zak's theorem on, 346
- signature
  - of quadratic form, 392
- simple Lie algebra, 397
- sine-Gordon equation, 196, 199, 208
- singular solutions, 163
- space form, 80
  - isometric immersions of, 166
- special Lagrangian submanifolds, 172, 237
- special linear group, 387
- special orthogonal group, 387
- special unitary group, 389
- Spencer cohomology, 152
- spin representation, 354, 356
- spinor variety, 104, 354
- stabilizer type, 253
- submanifold
  - associative, 238
  - Lagrangian, 157, 237
  - special Lagrangian, 172, 237
- superposition formula, 285, 300–305
- surface
  - Bonnet, 48
  - catenoid, 47
  - cone, 48
  - constant mean curvature, 202–204
  - cylinder, 48
  - developable, 44
  - flat, 45
  - focal, 210, 239
  - helicoid, 43
  - isothermal coordinates on, 93
  - linear Weingarten, 155, 197, 234
  - minimal, 63, 201
  - of revolution, 45, 200
  - parallel, 198
  - pseudospherical, 199
  - ruled, 45
  - warp of, 4
  - with degenerate Gauss image, 112
- symbol mapping, 129
- symbol relations, 117, 146
- symmetric connection, 259
- symmetric space, 266, 267
- symplectic form, 36, 157, 171, 184, 237, 387
- symplectic group, 387
- symplectic manifold, 36
- tableau, 117
  - determined, 131
  - of linear Pfaffian system, 146
  - of order  $p$ , 119
- tangent
  - bundle, 405
  - space, 405
- tangent star, 106
- tangential defect, 347
  - critical, 374
- tangential surface, 44
- tangential variety, 106
  - dimension of, 347
- tautological EDS
  - for torsion-free  $G$ -structures, 269
- tautological form
  - for coframe bundle, 66
- tensor algebra, 401
- tensor product, 382
- Terracini's Lemma, 107
- third fundamental form
  - projective, 333
- Toda lattice (2-dimensional), 288
- torsion
  - of  $G$ -structure, 250
  - of connection, 250
  - of curve in  $\mathbb{E}^3$ , 27
  - of linear Pfaffian system, 137, 147
- torsion-free connection, 72
- tractor bundle, 327
- transformation
  - Bäcklund, 205, 209, 304
  - Cole-Hopf, 205, 212
  - fractional linear, 22
  - Lie, 204
  - Miura, 207
- triangulation, 57



- triply orthogonal systems, 223–226
- umbilic point, 42
- uniruled variety, 339
- unitary group, 389
- variation of Hodge structure, 161
- variety
  - algebraic, 102
  - dual, 107, 341
  - flag, 105
  - minuscule, 353
  - rational homogeneous, 103
  - ruled, 339
  - secant, 106
  - Segre, 104
  - spinor, 104, 354
  - tangential, 106
  - uniruled, 339
  - Veronese, 105
- vector bundle
  - induced, 257
- vector field, 405
  - flow of  $a$ , 6
  - left-invariant, 18
- Veronese embedding, 105
- Veronese re-embedding, 105, 358
- Veronese variety, 105
  - fundamental forms of, 337
- vertical tangent space, 67
- vertical vector, 409
- Vessiot algebra, 296
- volume form, 50
  
- Waring problems, 383
- warp of a surface, 4
- wave equation, 175, 419
- wave maps, 288, 306
- web, 242
  - hexagonality of, 245
- wedge product, 384
  - matrix, 19
- Weierstrass representation, 201–202
- weight, 398
  - highest, 400
  - multiplicity of, 398
- weight diagram for invariants, 281
- weight lattice, 400
- weight zero invariant, 277
- Weingarten surface, 197
  - linear, 155, 197, 234
- Wirtinger inequality, 172
  
- Yamabe operator, 324
- Yamabe problem, 82
- Young symmetrizer, 83
- Young tableau
  - without repetitions, 83
  
- Zak's theorem
  - on linear normality, 346
  - on Severi varieties, 346
  - on tangencies, 350