

---

# Index

- $\int_D f \, d\mu$ , 25
- $\|x\|$  (Euclidean norm), 41
- $A_t$  ( $t$ -neighborhood), 47
- $\langle u, v \rangle$  (inner product), 87
- $\|u\|$  (norm), 87
- $V \oplus W$  (direct sum), 146
- $V \otimes W$  (tensor product), 149
- $R[x_1, \dots, x_n]$  (polynomial ring), 174
- $\langle \mathcal{F} \rangle$  (ideal generated by  $\mathcal{F}$ ), 186
- $\sqrt{I}$  (radical), 190
- $k[X]$  (coordinate ring), 197
- $X \cong Y$  (homeomorphic), 237
- $\partial$  (boundary operator), 303
- $\partial Y$  (boundary), 239
- $f \sim g$  (homotopic maps), 254
- $[X, Y]$  (homotopy classes), 255
- $X \simeq Y$  (homotopy equivalence), 256
- $X/A$  (quotient space), 262
- $X * Y$  (join), 264
- $|K|$  (polyhedron), 275
- $[f]_*$  (pointed homotopy class), 291
- $\chi$ -distribution, 71
- $\chi_a(x)$  (character), 92
- $\chi(G)$  (chromatic number), 260
- $\gamma(A)$  (Gaussian measure), 54
- $\lambda(A)$  (Lebesgue measure), 10
- $\lambda^*(A)$  (outer Lebesgue measure), 6
- $\pi_1(X)$  (fundamental group), 292
- $\pi_k(X)$  ( $k$ -th homotopy group), 297
- $\sigma$ -algebra, 12
- $\sigma$ -field, 12
- $\sigma$ -finite measure, 30
- abstract nonsense, 271
- additivity
  - countable, 8
  - finite, 8
- affine variety, 185
- Alexander duality, 321
- algebra, group, 144
- algebraic closure, 188
- algebraic geometry, 186
- algebraic topology, 253
- algebraically closed field, 186
- algebraically independent numbers, 181
- algorithm
  - division, 212
  - Haken's, 326
- almost everywhere, 14
- alternating representation, 144
- annulus, 254
- antipodal map, 258
- approximate identity, 134
- atlas, 323
- axiom of choice, 13, 125, 250
- axioms, Kolmogorov's, 33

- $B_k(K; \mathbb{Z}_2)$  ( $k$ -boundaries), 304  
 $B^n$  (Euclidean unit ball), 236  
 $B(x, r)$  (ball), 43  
 ball, 236  
     volume, 42, 60  
 Banach–Tarski paradox, 9  
 barycentric subdivision, 311  
 base, 238  
 basepoint, 291  
 basis  
     Fourier, 93  
     Gröbner, 213  
 Behrend’s construction, 105  
 Benford’s law, 35  
 Bernstein method, 74  
 Betti number, 307  
 Bézout’s inequality, 197  
     generalized, 208  
     higher-dimensional, 219  
 Bing’s house, 257  
 body, convex, 41  
 Boolean function, 99, 113  
     monotone, 117  
 Borel set, 12  
 Borsuk–Ulam theorem, 258  
 bottle, Klein, 284  
 boundary, 239  
      $k$ -boundary, 304  
 boundary operator, 303  
 Brouwer’s fixed-point theorem, 318  
 Brunn’s inequality, 44  
  
 $C_k(K; \mathbb{Z}_2)$  ( $k$ -chains), 302  
 Cantor set, 10, 241  
 cap, spherical, 64  
 categorical limit, 269  
 categorical product, 269  
 category, 267  
     opposite, 270  
 Cauchy equation, 125  
 cell complex, 280  
 central limit theorem, 55  
 chain  
      $k$ -chain, 303  
 chain complex, 306  
 chain map, 306  
 character, 88, 124, 150, 152  
     trivial, 89  
  
 Chebyshev’s inequality, 75  
 Cheeger inequality, 94  
 Chernoff’s inequality, 77  
 Chevalley’s theorem, 205  
 choice, axiom of, 13, 125, 250  
 chromatic number, 260  
 circle group, 87  
 $\text{cl } Y$  (closure), 239  
 class, homology, 304  
 class function, 151  
 clique complex, 278  
 closed set, 239  
 closure, 239  
     algebraic, 188  
 coboundary operator, 308  
 code, locally decodable, 169  
 coefficient, 174  
     leading, 187  
 coefficients, Fourier, 128  
 cohomology group, 308  
 communication complexity, 163  
 compact set, 247  
 compact space, 247  
 complement, orthogonal, 110, 147  
 complete measure, 30  
 completion, projective, 216  
 complex  
     cell, 280  
     chain, 306  
     clique, 278  
     CW, 280  
     flag, 278  
     independence, 279  
     order, 279  
     simplicial, 271  
 complexity, communication, 163  
 component  
     connected, 241  
     irreducible, 201  
 concave function, 41  
 cone, 265  
 conjecture  
     geometrization, 327  
     log-rank, 164  
     Poincaré, 328  
 conjugate elements, 151  
 connected space, 240  
 connected component, 241

- constant-degree expander, 63
- constructible set, 205
- construction, Behrend's, 105
- contagious vanishing, 185
- content
  - Jordan, 2
  - Minkowski, 48
- continuous map, 239
- contractible space, 257
- contravariant functor, 309
- convergence in distribution, 55
- convex body, 41
- convex function, 41
- convex hull, 41
- convex polyhedron, 41
- convex polytope, 41
  - enclosing  $S^n$ , 65
- convex set, 41
- convolution, 106, 158
- convolution as multiplication, 107
- conv  $X$  (convex hull), 41
- coordinate ring, 197
- coordinates, homogeneous, 215
- coproduct, 270
- correspondence
  - ideal-variety, 190
- countable additivity, 8
- counting measure, 16
- covariant functor, 309
- cover, open, 247
- cube
  - Hamming, 63
  - Hilbert, 246
- cup product, 309
- curve, moment, 275
- CW complex, 280
- cycle
  - $k$ -cycle, 304
- Daniell integral, 5
- deformation retract, 256
- deg  $f$  (degree of a polynomial), 174
- degree
  - of a polynomial, 174
  - of a variety, 208
- deleted product, 286
- delta function, Kronecker, 94
- $\varepsilon$ -dense set, 64
- dense set, 244
- density, 14
- derivative
  - Hasse, 182
  - partial, 182
- determinant, Jacobian, 222
- determinantal variety, 204
- diagram, Ferrer's, 161
- diameter, 17
- dictatorship, 113
- differentiable manifold, 323
- dimension
  - Hausdorff, 18
  - of a simplicial complex, 272
  - of a variety, 207
  - of a representation, 143
- Dirac measure, 16
- direct sum, 146
- Dirichlet's theorem, 131
- Dirichlet kernel, 131
- discrete topology, 242
- disjoint union, 266
- distribution
  - Gaussian, 53
  - normal, 54
    - tail estimates, 57
  - probability, 34
  - stable, 60
  - standard normal, 53
  - subgaussian, 76
  - uniform, 32
- division algorithm, 212
- domain
  - frequency, 128
  - invariance of, 318
  - time, 128
- domain, integral, 200
- dominated convergence theorem, 29
- duality
  - Alexander, 321
  - finite Pontryagin, 89
  - Pontryagin, 126
- dunce hat, 263
- $e(x)$ , 88
- $E[X]$  (expectation), 35
- elementary event, 32
- elements, conjugate, 151

- embedding, 283
  - Segre, 217
- entropy, 123
- epimorphism, 268
- equation, Cauchy, 125
- equidecomposable sets, 9
- equivalence, homotopy, 256
- equivalent representations, 143
- event, 32
  - elementary, 32
- everywhere, almost, 14
- exhaustion, method of, 2
- exotic sphere, 324
- expander, constant-degree, 63
- expectation, 35, 89
- extended real numbers, 6
  
- $\mathbb{F}_q$  (finite field), 173
- face, 273
- factorization, unique, 200
- fast multiplication of polynomials, 108
- fast Fourier transform, 86, 98
- Fatou's lemma, 27
- Fejér kernel, 134
- Fejér's theorem, 133
- Ferrer's diagram, 161
- field, 173
  - algebraically closed, 186
- finite additivity, 8
- finitely presented group, 294
- flag complex, 278
- $f_{\text{low}}$  (low-degree part), 115
- Fourier inversion, noncommutative, 158
- Fourier basis, 93
- Fourier coefficients, 128
- Fourier series, 85, 129, 130
- Fourier transform, 95, 127, 150
  - fast, 86, 98
  - inverse, 96, 129
  - noncommutative, 151
- free probability, 36
- frequencies, 86
- frequency domain, 128
- Fubini's theorem, 31
- function
  - Boolean, 99, 113
  - monotone, 117
  - class, 151
  - concave, 41
  - convex, 41
  - Hilbert, 198
  - Lipschitz, 66
  - log-concave, 53
  - majority, 113
  - measurable, 22, 23
  - simple, 23
  - unimodal, 45
- functional, Laplace, 78
- functor, 293
  - contravariant, 309
  - covariant, 309
- fundamental group, 292
  
- $G$ -linear map, 143
- Gauss map, 286
- Gauss sum, 112
- Gaussian distribution, 53
- Gaussian measure, 54
  - spherical shell, 70, 77
- Gaussian measure concentration, 68
- general linear group, 142
- general topology, 242
- geometric realization, 274
- geometric simplicial complex, 274
- geometrization conjecture, 327
- geometry, algebraic, 186
- $GL(n, \mathbb{K})$ , 20
- $GL(V)$ , 142
- graded lexicographic ordering, 209
- gradient, 182, 221
- graph
  - $k$ -colorable, 250
  - Kneser, 259
- Gröbner basis, 213
- Gromov's sphere waist theorem, 67
- group
  - circle, 87
  - cohomology, 308
  - finitely presented, 294
  - fundamental, 292
  - general linear, 142
  - homology, 301
  - homotopy, 299

- LCA, 126  
 matrix, 20  
 representation, 142  
 symmetric, 144  
   representations, 160  
 topological, 21  
 group algebra, 144
- $H_k(X; R)$  (homology group), 301  
 Haar's theorem, 21  
 Haar measure, 19, 127  
 Haefliger–Weber theorem, 287  
 Haken's algorithm, 326  
 Hamming cube, 63  
 Hamming metric, 63  
 Hasse derivative, 182  
 hat, dunce, 263  
 Hauptvermutung, 315  
 Hausdorff dimension, 18  
 Hausdorff measure, 17  
 Hausdorff space, 244  
 Heine–Borel theorem, 7, 251  
 Hessian matrix, 228  
 $HF_R(d)$  (Hilbert function), 198  
 Hilbert's third problem, 1  
 Hilbert basis theorem, 187  
 Hilbert cube, 246  
 Hilbert function, 198  
 Hilbert polynomial, 208  
 $\text{Hom}(X, Y)$  (morphisms), 268  
 homeomorphism, 237  
   and null set, 15  
 homogeneous coordinates, 215  
 homogeneous ideal, 216  
 homogeneous polynomial, 216  
 homology class, 304  
 homology group, 301  
 homotopic maps, 254  
 homotopy, 254  
   pointed, 291  
 homotopy equivalence, 256  
 homotopy group, 299  
   of a sphere, 299  
 homotopy type, 256  
 Hopf map, 300  
 house, Bing's, 257  
 hull, convex, 41  
 Hurewicz's theorem, 320
- hypercontractive inequality, 119  
 hypercontractive operator, 122
- $I_n$  (identity matrix), 152  
 $I(S)$  (vanishing ideal), 190  
 ideal, 186  
   homogeneous, 216  
   monomial, 209  
   prime, 201  
   radical, 190  
 ideal–variety correspondence, 190  
 identity, approximate, 134  
 independence complex, 279  
 induced subcomplex, 272  
 inequality  
   Bézout's, 197  
   Bézout's  
     generalized, 208  
     higher-dimensional, 219  
   Brunn's, 44  
   Chebyshev's, 75  
   Cheeger, 94  
   Chernoff's, 77  
   hypercontractive, 119  
   isoperimetric, 48  
   Jensen's, 79  
   log-Sobolev, 123  
   Markov's, 75  
   Prékopa–Leindler, 50  
   Young's, 109
- influence, 113  
   total, 114  
 $\text{Inf}_k(f)$  (influence), 113  
 inner product, 87, 90  
 int  $Y$  (interior), 239  
 integral  
   Daniell, 5  
   Lebesgue, 3, 25  
   Riemann, 2  
 integral domain, 200  
 interior, 239  
 invariance of domain, 318  
 invariant subspace, 145  
 inverse Fourier transform, 96, 129  
 inversion  
   Fourier, noncommutative, 158  
 irreducible representation, 145  
 irreducible component, 201

- irreducible polynomial, 188
- irreducible variety, 201, 203
- isomorphism, 203, 268
  - of simplicial complexes, 273
- isoperimetric inequality, 48
- isoperimetric problem, 46, 63
- Jacobian determinant, 222
- Jensen's inequality, 79
- Johnson–Lindenstrauss lemma, 72
- join, 264, 278
- joint, 181
- Jordan curve theorem, 321
- Jordan content, 2
- kernel
  - Dirichlet, 131
  - Fejér, 134
- KKL theorem, 113
- Klein bottle, 284
- Kneser graph, 259
- Kolmogorov's axioms, 33
- Kronecker delta function, 94
- Kuratowski's theorem, 283
- $L^1(G)$  (integrable functions), 127
- $\ell_1$ -product, 78
- Lévy's lemma, 66
- Laplace functional, 78
- law, Benford's, 35
- LCA group, 126
- leading coefficient, 187
- leading monomial, 209
- Lebesgue covering lemma, 314
- Lebesgue density theorem, 15
- Lebesgue integral, 3, 25
- Lebesgue measure, 3, 10
- Legendre symbol, 112
- lemma
  - Fatou's, 27
  - Johnson–Lindenstrauss, 72
  - Lévy's, 66
  - Lebesgue covering, 314
  - random projection, 73
  - Riemann–Lebesgue, 135
- limit, categorical, 269
- line, Sorgenfrey, 243
- Lipschitz function, 66
- Littlewood's principles, 11, 23
- locally compact space, 21
- locally decodable code, 169
- log-concave function, 53
- log-rank conjecture, 164
- log-Sobolev inequality, 123
- long ray, 243
- longest increasing subsequence, 168
- Lovász–Kneser theorem, 260
- Lyusternik–Schnirelman theorem, 258
- majority function, 113
- manifold, 321
  - differentiable, 323
  - smooth, 323
  - topological, 322
  - with boundary, 322
- map
  - antipodal, 258
  - chain, 306
  - continuous, 239
  - $G$ -linear, 143
  - Gauss, 286
  - Hopf, 300
  - nullhomotopic, 255
  - of pairs, 292
  - open, 240
  - pointed, 291
  - rational, 206
  - regular, 203
  - simplicial, 273
- maps, homotopic, 254
- Markov's inequality, 75
- Maschke's theorem, 146
- matching, perfect, 176
- matrix
  - Hessian, 228
  - Sylvester, 192
  - unitary, 148
- matrix group, 20
- measurable function, 22, 23
- measurable rectangle, 30
- measurable set, 10
- measure, 16
  - complete, 30
  - counting, 16
  - Dirac, 16
  - Gaussian, 54

- Haar, 19, 127
- Hausdorff, 17
- Lebesgue, 3, 10
  - outer Lebesgue, 6
  - probability, 34
  - product, 30
  - $\sigma$ -finite, 30
- measure concentration
  - Gaussian, 68
  - Hamming cube, 77
  - product space, 78
  - sphere, 62, 69
  - various spaces, 62
- measure space, 5, 16
- median, 66
- method
  - Bernstein, 74
  - of exhaustion, 2
- metric, 236
  - Hamming, 63
- metric space, 236
- metrizable space, 242
- Minkowski content, 48
- Minkowski sum, 45
- model, vector, 40
- module, Specht, 161
- moment curve, 275
- monomial, 174
  - leading, 209
  - number of, 180
- monomial ideal, 209
- monomial ordering, 209
- monomorphism, 268
- monotone Boolean function, 117
- monotone convergence theorem, 28
- morphism, 267
  - of varieties, 202, 217
- $N(\mu, \sigma^2)$  (normal distribution), 60
- negative part, 23
- neighborhood, 238
  - $t$ -neighborhood, 47
- nerve theorem, 279
- Noetherian ring, 187
- noise operator, 122
- non-measurable set, 13
- noncommutative Fourier transform, 151
- nonsense, abstract, 271
- nonsingular zero, 222
- norm, 87, 90
- normal distribution, 54
  - tail estimates, 57
- normal space, 244
- normal surface, 325
- null set, 14
- nullhomotopic map, 255
- Nullstellensatz, 188
- number
  - Betti, 307
  - chromatic, 260
  - of components of a variety, 226
  - of monomials, 180
- numbers, algebraically
  - independent, 181
- open cover, 247
- open map, 240
- open set, 237
- operator
  - boundary, 303
  - coboundary, 308
  - hypercontractive, 122
  - noise, 122
- opposite category, 270
- order complex, 279
- ordering
  - graded lexicographic, 209
  - monomial, 209
- orthogonal complement, 110, 147
- outer Lebesgue measure, 6
- paracompact space, 252
- paradox, Banach–Tarski, 9
- Parseval’s theorem, 96
- part
  - negative, 23
  - positive, 23
  - torsion, 307
- partial derivative, 182
- partitions of  $n$ , 161
- path, 241
- path-connected space, 241
- perfect matching, 176
- permutation representation, 144
- Plancherel’s theorem, 96

- plane
  - projective, 284
  - Sorgenfrey, 243
- Poincaré conjecture, 328
- point, random, 31
- point-set topology, 242
- pointed homotopy, 291
- pointed map, 291
- pointed space, 291
- Poisson summation formula, 111, 136
- Polish space, 245
- polyhedron
  - convex, 41
  - of a simplicial complex, 275
- polynomial
  - degree, 174
  - fast multiplication, 108
  - Hilbert, 208
  - homogeneous, 216
  - irreducible, 188
  - zero, 174
- polynomial identity testing, 179
- polytope, convex, 41
  - enclosing  $S^n$ , 65
- Pontryagin dual, 89
- Pontryagin duality theorem, 126
- positive part, 23
- Prékopa–Leindler inequality, 50
- prime ideal, 201
- principle
  - uncertainty, 97
- principles, Littlewood's, 11, 23
- probability, 33
  - free, 36
- probability distribution, 34
- probability measure, 34
- probability space, 32
- problem
  - Hilbert's third, 1
  - isoperimetric, 46, 63
  - undecidable, 253, 294
- product
  - categorical, 269
  - cup, 309
  - deleted, 286
  - inner, 87
  - $\ell_1$ , 78
  - tensor, 149
- product space, measure
  - concentration, 78
- product, inner, 90
- product measure, 30
- product topology, 249, 265
- projection, 207
  - random, 73
- projection theorem, 218
- projective completion, 216
- projective plane, 284
- projective space, 214
- property testing, 99
- quadratic residue, 111
- quotient space, 262
- $\overline{\mathbb{R}}$  (extended reals), 6
- Rabinowitsch trick, 190
- radical ideal, 190
- random projection lemma, 73
- random point, 31
  - on  $S^n$ , 41, 59
- random projection, 73
- random variable, 35
- rational map, 206
- ray, long, 243
- real numbers, extended, 6
- realization, geometric, 274
- rectangle, measurable, 30
- regular map, 203
- regular representation, 144
- regular space, 244
- rejection sampling, 42
- representation, 142
  - alternating, 144
  - dimension, 143
  - irreducible, 145
  - permutation, 144
  - regular, 144
  - symmetric group, 160
  - trivial, 144
- representations, equivalent, 143
- $\text{Res}(f, g, x)$  (resultant), 192
- residue, quadratic, 111
- resultant, 192
- retract, deformation, 256
- retraction, 319



- Riemann integral, 2
- Riemann–Lebesgue lemma, 135
- ring, 173
  - coordinate, 197
  - Noetherian, 187
- Roth’s theorem, 101
  
- $S_n$  (symmetric group), 144
- $S^n$  (Euclidean unit sphere), 236
- sample space, 32
- sampling, rejection, 42
- Schur’s theorem, 153
- Schwartz–Zippel theorem, 175
- second-countable space, 245
- Segre embedding, 217
- semialgebraic set, 186
- separable space, 245
- series, Fourier, 85, 129, 130
- set
  - Borel, 12
  - Cantor, 10, 241
  - closed, 239
  - compact, 247
  - constructible, 205
  - convex, 41
  - dense, 244
  - $\varepsilon$ -dense, 64
  - measurable, 10
  - non-measurable, 13
  - null, 14
  - open, 237
  - semialgebraic, 186
  - simplicial, 281
  - Smith–Volterra–Cantor, 15
  - Vitali, 9
- sets, equidecomposable, 9
- sign pattern, 231
- simple function, 23
- simplex, 273
- simplicial approximation theorem, 312
- simplicial complex, 271
  - geometric, 274
  - isomorphism, 273
  - polyhedron, 275
- simplicial map, 273
- simplicial set, 281
- simply connected space, 293
  
- Smith–Volterra–Cantor set, 15
- smooth manifold, 323
- $SO(n, \mathbb{R})$ , 20
- Sorgenfrey line, 243
- Sorgenfrey plane, 243
- space
  - compact, 247
  - connected, 240
  - contractible, 257
  - Hausdorff, 244
  - locally compact, 21
  - measure, 5, 16
  - metric, 236
  - metrizable, 242
  - normal, 244
  - paracompact, 252
  - path-connected, 241
  - pointed, 291
  - Polish, 245
  - probability, 32
  - projective, 214
  - quotient, 262
  - regular, 244
  - sample, 32
  - second-countable, 245
  - separable, 245
  - simply connected, 293
  - $T_i$ , 243
  - topological, 237
- Specht module, 161
- sphere, 236
  - exotic, 324
  - homotopy groups, 299
  - waist theorem, 67
- spherical shell, Gaussian measure, 70, 77
- spherical cap, 64
- stable distribution, 60
- standard normal distribution, 53
- standard tableau, 162
- subadditivity, 8
- subbase, 239
- subcomplex, 272
  - induced, 272
- subcover, 247
- subdivision, 310
  - barycentric, 311
- subgaussian distribution, 76

- subrepresentation, 145
- subsequence, longest increasing, 168
- subspace, 238
  - invariant, 145
- sum
  - direct, 146
  - Gauss, 112
  - Minkowski, 45
- summation formula, Poisson, 111, 136
- $\text{supp}(f)$  (support), 98
- support, 98, 276
- surface
  - normal, 325
  - two-dimensional, classification, 325
- suspension, 265
- Sylvester matrix, 192
- symbol, Legendre, 112
- symmetric group, 144
  - representations, 160
- $T$  (circle group), 87
- $T_i$  space, 243
- tableau, 161
  - standard, 162
- tabloid, 161
- tensor power trick, 123
- tensor product, 149
- term, 174
- testing
  - property, 99
- testing, polynomial identity, 179
- theorem
  - Borsuk–Ulam, 258
  - Brouwer’s fixed-point, 318
  - central limit, 55
  - Chevalley’s, 205
  - Dirichlet’s, 131
  - dominated convergence, 29
  - Fejér’s, 133
  - Fubini’s, 31
  - Gromov’s sphere waist, 67
  - Haar’s, 21
  - Haefliger–Weber, 287
  - Heine–Borel, 7, 251
  - Hilbert basis, 187
  - Hurewicz’s, 320
  - Jordan curve, 321
  - KKL, 113
  - Kuratowski’s, 283
  - Lebesgue density, 15
  - Lovász–Kneser, 260
  - Lyusternik–Schnirelman, 258
  - Maschke’s, 146
  - monotone convergence, 28
  - nerve, 279
  - Parseval’s, 96
  - Plancherel’s, 96
  - Pontryagin duality, 126
  - projection, 218
  - Roth’s, 101
  - Schur’s, 153
  - Schwartz–Zippel, 175
  - simplicial approximation, 312
  - Tietze extension, 245
  - Tonelli’s, 31
  - Tychonoff’s, 250
  - Urysohn metrization, 245
  - van Kampen–Flores, 285
- Tietze extension theorem, 245
- time domain, 128
- Tonelli’s theorem, 31
- topological group, 21
- topological manifold, 322
- topological space, 237
- topology, 237
  - algebraic, 253
  - discrete, 242
  - general, 242
  - point-set, 242
  - product, 249, 265
  - Zariski, 202, 243
- torsion part, 307
- torus, 263
- total influence, 114
- $\text{Tr } A$  (trace), 151
- trace, 151
- transform
  - Fourier, 95, 127, 150
- triangulation, 277
- trick
  - Rabinowitsch, 190
  - tensor power, 123
- trivial character, 89

- trivial representation, 144
- Tychonoff's theorem, 250
- type, homotopy, 256
  
- uncertainty principle, 97
- undecidable problem, 253, 294
- uniform distribution, 32
- unimodal function, 45
- union, disjoint, 266
- unique factorization, 200
- unitarity, Weyl's, 148
- unitary matrix, 148
- Urysohn metrization theorem, 245
  
- $V(\mathcal{F})$  (variety of  $\mathcal{F}$ ), 185
- $V(K)$  (vertex set), 271
- van Kampen–Flores theorem, 285
- vanishing, contagious, 185
- variable, random, 35
- variety
  - affine, 185
  - degree, 208
  - determinantal, 204
  - dimension, 207
  - irreducible, 201, 203
  - morphism, 217
  - number of components, 226
- vector model, 40
- vertex, 271
- Vitali set, 9
- volume of a ball, 42, 60
  
- wavelets, 86
- wedge, 292
- Weyl's unitarity, 148
  
- Young's inequality, 109
  
- $\mathbb{Z}_2$ -map, 286
- $\mathbb{Z}_2$ -space, 286
- $Z_k(K; \mathbb{Z}_2)$  ( $k$ -cycles), 304
- Zariski topology, 202, 243
- zero, nonsingular, 222
- zero polynomial, 174