

Index

- algebraic curve, 287
 algebraic number field, 287
 analytic function
 classical, 133, **309**
 discrete, 134, **139**
 Andreev-Thurston Theorem, **332**
 angle sum, θ_R , **56**
 boundary, 149, 161
 formulas, **57**
 angular derivative, **171**
 angular resolution, **335**
 Apollonian packing, **214**
 arclength element, ds , **41**
 area element, ds^2 , **41**
 argument principle, 68, **141**, 310
 argument, $\arg(z)$, **40**
 asymptotic value, **188**, 191
 asymptotically parabolic, **152**, 257, 262
 atlas, **36**, 50, 276
 augmented boundary, **104**, 106
 augmented carrier, **104**
 automorphism group, $\text{Aut}(\cdot)$, **42**, 48, 140, 207, 231, 280, 289, 313

 barycentric coordinates, 139, **316**
 mapping, **316**
 subdivision, **159**, 276
 Beltrami equation, **314**
 Belyĭ pair
 classical, **287**
 discrete, **210**, 288
 Belyĭ's Theorem, **287**
 Benjamini-Schramm Theorem, **175**
 Bieberbach Conj., *see* deBranges Theorem
 Blaschke product, 268
 classical, **163**
 discrete, **164**, 174
 boundary edge, 37
 boundary value problem, 143, 148, 167
 boundary vertex, 37

 brain flattening, **299**, 301
 branch point, 56, **142**, 197, 344
 classical, 135, **311**
 fractional, 208
 multiplicity, 142
 order, 56, **141**
 branch structure, **142**
 infinite, 175
 polynomial, **197**
 branch value, **142**, 165
 Brooks parameter, **328**
 Brooks quadrilateral, 231, **327**
 Brooks spiral, 324, 330
 Brownian motion, 234, 264, 266

 \mathcal{C} -bound, 185, 259, **317**
 cadre, **106**, 113, 171
 Carathéodory Kernel Theorem, 253, 270, **315**
 carrier, **58**, 251
 Cauchy-Riemann equations, **312**, 340
 center function, **235**
 chain (of faces), **38**, 59
 null, **60**
 circle packing, **51**
 affine, **215**
 rectangular, 162
 alternate notions, 214
 circle packing embedding, 335
 circular, *see* reasoning
 clone, **153**
 combinatorial
 closed disc, **54**, 62
 flower, **38**, 56
 open disc, **54**, 73
 rectangle, **162**, 218, 223
 sphere, **54**, 72
 surface, **116**
 compatibility, **103**
 complex, **51**, 54
 compact, **54**, 201
 hyperbolic, **52**
 labeled, **55**
 parabolic, **52**
 spherical, **52**
 universal covering, **122**
 composition, 173
 conductance, *see* random walk
 cone angle, **275**, 281, 304
 cone point, **275**
 conformal, 137, 219, 281, **309**
 automorphism, **42**
 rectangle, 220, **315**
 ring domain, **315**
 torus, **120**, 215
 conformal mapping
 classical, 249, **309**
 discrete, 137, **217**, 249
 conformal structure, **50**, 51, 276
 classical, 275
 discrete, 137, **219**, 283
 conformal tiling, **290**
 conformally equivalent, 50, **310**
 convergence
 combinatorial, **150**, 262
 quasiconformal, 254, 279, 316
 covering theory, 202, 279
 classical, **120**
 discrete, **122**
 Coxeter spiral, 324, 330
 cross ratio, **339**
 curvature, 35, **42**, 48, 243
 curvature flow, 305

 deBranges Theorem, **176**
 defining equation, 287
 degree, **38**, 73, 227
 bounded, 174, 181, 257, 279
 Dehn twist, 156
 Descartes Circle Theorem, **320**
 dessin, **286**, 286, 293, 294
 development, **59**, 81, 207, 209
 dichotomy, **74**, 128, 181, 225, 262
 Dieudonné-Schwarz Lemma, **177**
 dilatation, *see* quasiconformal
 disc algebra, 167

- Distortion Lemma, Discrete, **161**
 Branched, **170**
- domain construction, **160**, 167, 196
- doubling, **156**, 162
- Doyle spiral, 25, 94, 188, 273, **322**, 330
- Dubajko's Theorem, **235**
- element, **104**
- entire function, discrete, 181
- equilateral surface, **276**, 283, 287
- error function, $\operatorname{erf}(\cdot)$, **189**, 340
- essentially unique, **52**
- euclidean plane, \mathbb{C} , **39**, 42
- Euler characteristic, **39**, 143
- exit probability, 242, 264
- exponential, discrete, 188, 272
- extension of domain, 114
- extremal length, **220**, 226
- Farey triangulation, 214
- Fatou Theorem, **175**
- Fibonacci sequence, **321**, 326, 335
- finite topological type, 230
- fixed-point index, η , **98**, 113, 171
- fundamental domain, **120**, 127, 203, 212
- fundamental group, 36, **39**, 122
- gaussian curvature, **42**
- general position, **101**
- genus, 36
- geodesic, **41**
- geometric convergence, **79**, 151, 189
- ghost circle, 61, 117, 125, **127**
- golden ratio φ , 321, 325, **329**, 330
- Green's function, 241
- harmonic function
 classical, **312**
 discrete, **234**, 236
- harmonic measure, 112, 242, 264
 classical, **84**
 discrete, **86**
- He-Schramm Theorem, **266**
- Hexagonal Packing Lemma, **251**, 259
- hexagonal refinement, **158**, 277, 279, 284, 298
- holomorphic differential, 208
- holonomy, **207**
- homotopy, discrete, **38**
- horocycle, **46**, 213
- hyperbolic complex, **52**, 74
- hyperbolic contraction, **161**, 167, 312
- hyperbolic density, **45**
- hyperbolic cusp, **213**
- hyperbolic plane, \mathbb{D} , **39**, 45
- hyperelliptic Riemann surface, 156
- ideal
 boundary, **46**
 triangle, **47**, 213
 vertex, **46**, 154
- image surface, 165, 168, 200, 273, **311**
- in situ packing, **218**, 277, 281
- integrable systems, discrete, 339
- interior edge, 37
- interior vertex, 37
- inversive distance packing, **332**
- isometry, **42**
- isotopy, **99**
- j -function, **212**, 245
- Jordan curve, 98, **310**
- Jordan domain, 85, 220, **310**
- Königsfunction, 293
- Kakutani Theorem, **234**
- Klein surface, 9, 245
- Koebe function, **176**
- Koebe's 1/4-Theorem, **177**
- Koebe-Andreev-Thurston Theorem, **72**, 200, 267
- label, **55**
 branched, **56**, 141
 maximal, **70**, 80
 packing, **56**
- Laplace equation, **312**
- Laplace operator, **42**
- lattice group, **118**
- Length-Area Lemma, **250**, 269
- light interior mapping, **140**, 310
- Lindelöf Theorem, **175**
- Liouville Theorem, **312**
 Discrete, **181**
 quasiconformal, 185, **314**
- local modification, **38**, 60
- locally univalent, 94, **141**, 311
- logarithmic branching, **188**
- Löwner's Lemma, Discrete, **171**
- Möbius transformation, **44**
- maximal packing, **52**, 70, 124, 333
 branched, **164**, 169, 174, 187
- Maximum Principle, **150**
- meromorphic function, discrete, 181, 201, 208, 211
- metric
 d_R , **55**, 81
 ambient, 140, **213**, 225
 intrinsic, **50**, 202
 path, **55**
- minimal surface, discrete, 342
- Mod (modulus)
 classical, **315**
 conformal, 220
 graph, **222**
 packing, **221**, 225
- rectangle, 260, 302
 ring domain, 225
 torus, **229**
- modular function, 212, 215
- modular surface, 212
- moduli space, 229, 230
- Monodromy Theorem, **58**, 142, 144
- monotonicity
 angle, **63**, 95
 angle sum, **65**, 243
 area, **65**
 combinatoric, **70**
 global, 148
 harmonic measure, **87**, 112, 114
 label, **70**, 74
 labeled complex, **81**
 modulus, **225**
 segment, 82, 83
 triangle, **63**
- Nehari's condition, **180**
- normal family, **151**, 253, 270, 315
- null homotopic, **39**
- oval of Descartes, 325
- overlap packing, 284, **332**
- packable surface, **229**, 231
- packing algorithm, 29, 195, 243, 303
- packing condition, **56**, 133
- packing label, **56**
- packing layout, 29, 58, **126**, 306
- parabolic complex, **52**, 74
- parabolic surface, 231
- pasting
 combinatorial, **154**
 geometric, **157**, 165, 205, 209, 282
- Perron method, **66**, 144, 148, 238
- phyllotaxis, 325
- Picard surface, 28, 211
- Picard Theorem
 Discrete, **182**
 classical, **312**
- polynomial, discrete, 182, 271
- proper map, **68**, 163, 182
- quasiconformal, 253, **314**
 dilatation, 255, 279, **313**, 317
 quasiregular, 314
- radial limit, 170
- random walk, **232**
 conductance, **233**, 237
 simple, 229, **232**
 tailored, **235**, 266
- range construction, **160**, 165, 199, 205
- ratio function $f^\#$, **139**, 170, 179, 222, 263

rational function, discrete, 195, 345
 rational iteration, 293
 reasoning, *see* circular
 repack, **20**, 29
 Riemann Mapping Theorem, 249, 267, 292, **312**
 Discrete, **160**
 Inverse, **173**
 Riemann sphere, \mathbb{P} , **39**, 43
 Riemann surface, **50**, 201, 219, 275
 discrete, **219**
 Riemann-Hurwitz, 195, **204**, 344
 Ring Lemma, **73**, 250, 318
 in the Large, 174, **183**, 261, 270
 Rodin-Sullivan Theorem, **250**, 257, 266

 schlicht, *see* univalent
 Schwarz Lemma, Discrete, **161**
 Branched, **169**
 Schwarz reflection, 158, **192**, 344
 Schwarz triangle, 344
 Schwarz-Christoffel method, 168, 224, 305

Schwarz-Pick Lemma, Discrete, **161**
 classical, **312**
 Schwarzian derivative, **180**
 simplicial complex, 37, 122
 simply connected, 36
 sine, discrete, **194**, 273
 sphere packing, 31, 216
 spherical complex, **52**, 72
 square grid packing, **339**
 squared rectangle, 224
 Standing Assumptions, **136**, **202**
 stereographic projection, **40**
 Stoilow's Theorem, **141**, 164, 182, 196, 273, 288
 subdivision rule, **292**
 subordination, **173**
 subpacking, **66**
 super-step method, 303
 superharmonic function, 233
 superpacking, 144, 170
 surface, 35

 Teichmüller space, 229, 280, 288
 transition probability, **232**, 241

 triangulation, **37**, 51, 327
 infinitesimal, 219
 tripartite complex, **210**, 212, 286
 type, 75, 279
 type problem, **225**, 229, 234, 293

 uniform neighbor model, **244**
 Uniformization Theorem, Discrete, **51**, 160, 201
 unit circle, \mathbb{T} , **41**
 univalence criterion, 180
 univalent function
 classical, 176
 discrete, 161
 universal cover, *see* covering theory

 van Kampen's Theorem, **156**, 165, 200

 welding
 classical, **296**
 combinatorial, **156**, 285, 297
 Whitehead move, 230, **337**
 Williams Theorem, **298**
 winding number, *w*, **97**, 310