

Index

- absorption cross-section, 95
- anomalous resonance, 383
- arclength parametrization, 64
- argument principle, 7, 8, 415
- asymptotic expansion, 240, 241, 245
- asymptotic formula, 98, 101, 174, 180

- backpropagation, 316
- band function, 229
- Barnett-Greengard method, 233
- Bessel function, 109
- Bethe-Sommerfeld conjecture, 229
- biperiodic grating, 209, 221
- Born approximation, 88
- boundary integral method, 227
- boundary-layer corrector, 405
- Brillouin zone, 105, 166, 227, 228, 232, 253, 258
- bubble phononic crystal, 453

- Calderón identity, 25, 28
- capacitance matrix, 461
- capacity, 22, 424, 433
- characteristic value, 9, 231, 240, 252
- Cheng-Greengard method, 304
- cloaking, 355
- compact operator, 8, 144
- conormal derivative, 142, 167
- continuous spectrum, 306, 473

- defect mode, 254
- dielectric grating, 202
- diffraction gratings, 195
- dipolar approximation, 103, 351
- direct fiber decomposition, 229
- direct integral, 229
- Dirichlet function, 80, 147
- Dirichlet-to-Neumann map, 22, 247, 270
- discrete spectrum, 473
- dispersion relation, 229
- double-layer potential, 21, 69, 142
- Drude model, 285, 294, 408
- duality, 20

- effective medium theory, 40, 286, 333, 438

- eigenvalue, 76–78, 106, 146
- eigenvalue perturbation, 183
- eigenvector, 9
- elastic cavity, 183
- elastic moment tensor, 164
- elastic scattering coefficient, 159, 374
- electromagnetic scattering, 120, 196
- empty resonance, 233, 467
- equivalent impedance boundary condition, 405
- Eshelby conjecture, 45
- essential spectrum, 29, 308, 473
- Ewald’s method, 108, 110, 119, 166, 225
- extinction cross-section, 95, 285

- factorization, 8, 11, 13
- far-field, 39, 92, 360
- Faraday cage, 384
- finite Hilbert transform, 416
- finitely meromorphic operator, 10, 11
- Floquet condition, 228
- Floquet theory, 257, 259
- Floquet transform, 228
- focusing eigenmode, 81
- Fourier transform, 166, 228
- Fréchet derivative, 183, 477–479
- Fredholm alternative, 8, 11, 264
- Fredholm operator, 9, 11, 227, 231, 232, 258, 422
- frequency formula, 424
- fundamental solution, 21, 68, 141, 142

- Gâteaux derivative, 253
- generalized argument principle, 13, 14, 81, 84, 173, 174
- generalized gradient, 253
- generalized polarization tensor, 357
- generalized Rouché’s theorem, 13, 14, 227, 240, 241, 258, 262, 266, 415, 422, 423
- geometric multiplicity, 83
- Gohberg-Sigal theory, 455
- GPT-vanishing structure, 357
- Graf’s formula, 90, 109
- grating formula, 199, 200

- Green's formula, 69, 143
- Hamilton-Jacobi equation, 477, 478
- Hankel function, 105, 109, 221
- harmonic conjugate, 27, 28, 42, 154
- Hashin-Shtrikman bounds, 43
- Helmholtz decomposition, 121
- Helmholtz equation, 68, 105, 144, 221
- Helmholtz resonator, 420
- Helmholtz-Kirchhoff identity, 88
- high-contrast medium, 227, 258, 325
- Hilbert inversion formula, 417, 418
- Hodge decomposition, 213
- homogeneous harmonic polynomial, 59
- index, 9
- inverse Fourier transform, 166
- invisibility, 355, 384
- Jacobi-Anger expansion, 91
- joint sparsity, 318
- jump formula, 22, 69, 106, 142, 167
- Kelvin matrix, 142
- Kirchhoff migration, 315, 317, 322
- Kramers-Kronig relations, 96, 285
- Kummer's transformation, 108, 110
- Kupradze matrix, 141
- Lamé system, 142, 166, 183, 258
- Laplace equation, 21
- lattice sum representation, 57, 108, 109
- Laurent series expansion, 10
- layer potentials, 19, 68, 105, 106
- leading-order term, 175, 176, 241, 243
- level set method, 253, 351, 477
- Lippmann-Schwinger representation, 88, 318
- low-frequency, 107
- Möbius transformation, 385, 393
- maximal resolving order, 350
- maximum principle, 15
- Maxwell's equations, 120, 195, 283, 284
- Maxwell-Garnett theory, 288
- measurement noise, 317
- metasurface, 403, 438
- method of images, 302, 304
- min-max principle, 248, 275, 276
- Minnaert resonance, 429, 432, 438, 453, 468
- Muller's method, 7, 16, 17, 76, 169, 227, 232, 262, 465
- multiple eigenvalue, 83
- multiplicity, 9
- multipolar expansion method, 101, 350
- multipole expansion method, 233, 304, 467
- MUSIC algorithm, 315, 316, 320, 351
- near-cloaking, 355
- Neumann function, 78–80, 147, 421
- Neumann–Poincaré operator, 19, 23, 30, 33, 37, 38, 51, 55, 62, 85, 148, 150, 152, 153, 155, 156, 283, 286, 287, 385, 406, 431
- Newton's method, 16
- Newtonian potential, 384, 385
- nonlinear eigenvalue problem, 182
- normal point, 10
- null multiplicity, 10
- operator-valued function, 9, 13
- optical theorem, 95, 96, 140, 285, 360
- optimal control algorithm, 183, 351
- optimal design, 252
- outgoing fundamental solution, 69
- perfectly conducting grating, 197
- periodic Green's function, 56
- phononic band gap, 257
- phononic crystal, 257
- photonic band gap, 227, 229
- photonic crystal, 227, 229, 252
- photonic crystal fiber, 255
- Plancherel theorem, 228
- plasmonic nanoparticle, 405
- plasmonic resonance, 283, 284
- plasmonic structure, 383
- Poincaré's min-max principle, 275, 276, 279
- point interaction approximation, 440
- point spectrum, 473
- Poisson's summation formula, 56, 105, 166, 221
- polarization tensor, 39, 164, 176
- polarization tensor of multiple particles, 104
- pole-pencil decomposition, 415, 421, 422
- quadrupole, 391
- quality factor, 182
- quasi-momentum, 166, 227, 228, 258
- quasi-periodic capacity, 458
- quasi-periodic double-layer potential, 106, 167
- quasi-periodic fundamental solution, 105, 106, 166
- quasi-periodic layer potentials, 105, 166, 221
- quasi-periodic Minnaert resonance, 429, 455
- quasi-periodic single-layer potential, 106, 167
- quasi-static plasmonic resonance, 285
- radiation condition, 69, 87, 127, 143
- rank, 9
- reciprocal lattice, 105
- reciprocity property, 86, 89, 159, 200
- regular point, 10
- Rellich's lemma, 72
- representation formula, 145, 170, 230

- residue theorem, 7, 243
- resolution limit, 88
- resolution of identity, 28, 309, 473
- resonance, 182
- resonator, 169
- reverse-time migration, 315
- root function, 9
- Rouché's theorem, 7

- S-vanishing structure, 360, 379
- scaling property, 230
- scattering amplitude, 93, 159, 162, 368, 372, 379
- scattering coefficient, 131, 162, 163, 356, 359, 360, 367
- scattering cross-section, 95, 96, 355, 359, 360
- scattering pole, 420
- scattering tensor, 101, 104
- Schrödinger operator, 229
- sensitivity analysis, 240, 249
- shape deformation, 190
- shape derivative, 64, 81, 82, 86, 180, 190, 254, 286, 408, 479
- shielding, 384, 393
- signal-to-noise ratio, 317, 351
- sinc kernel, 317
- single-layer potential, 21, 69, 142
- Sobolev spaces, 19
- Sommerfeld-Kupradze radiation condition, 144
- spatial representation, 105
- spectral decomposition, 78, 80, 147
- spectral family, 473
- spectral representation of the Green's function, 105
- spectral resolution theorem, 28, 474
- splitting, 83, 294
- Steinberg's theorem, 16, 232, 415, 422
- sub-wavelength bandgap, 453, 454
- sub-wavelength resonance, 415, 424
- sub-wavelength resonator, 429
- sum rules, 41, 97
- super-resolution, 325, 335, 336, 415, 438
- superlens, 383, 384, 393
- symmetrization principle, 25, 400

- Taylor's formula, 39, 57
- tensor product, 191
- theorem of Coifman, McIntosh, and Meyer, 67
- trace operator, 10, 11, 13, 82, 174
- transformation optics, 299, 300, 355
- transmission problem, 144–146
- transverse electric polarization, 253
- transverse magnetic polarization, 253
- twin spectrum relation, 27

- unique continuation, 73
- uniqueness, 72
- Weyl's criterion, 473
- whispering gallery eigenmode, 81