

- ω - β plot, 269
- absolute electrostatic potential, 122
- action at a distance, 2
- active material, 245
- aether, 84
- Ampere's force law, 171
- Ampere's law, 21
 - for static fields, 157
 - frequency-domain, 196
 - initial conditions, 22
 - integral form, 49
 - invariance, 40
 - kinematic form, 53
 - phasor form, 240
 - with magnetic sources, 59
- Ampere, André-Marie, 2
- amplitude spectrum, 262
- analytic function, 201, 565
- angular spectrum, 334, 340, 342
 - of a line source, 337
- anisotropic material, 28, 198, 200, 211, 219, 246
 - lossless, 207
- anomalous dispersion, 228, 269
- antenna, 433, 457
 - aperture, 435
 - far-zone fields, 434
 - rectangular waveguide, 435
 - biconical, 328
 - circular loop, 479
 - input admittance, 481
 - dipole, 425, 464
 - far-zone fields, 427
 - feed models, 464
 - frill, 466
 - slice gap, 464
 - Hertzian dipole, 381
 - input impedance, 465
- antenna pattern
 - power pattern, 425
- anti-resonance, 468
- antiferromagnetic material, 28, 234
- antiresonance, 482
- arc plot, 231
- assembly energy, 121, 143, 174, 176
- associated Legendre equation, 617
- associated Legendre functions, 617
- atomic polarization, 221
- attenuation, 268
- attenuation constant, 264
 - in a waveguide, 392
- auxiliary equations, 22, 50
 - large-scale forms, 51
- average Green's function, 460
- axial vector, 58
- backscatter, 408
- backward wave, 98, 269, 346
- band-limited function, 561
- basis function, 442
 - classification
 - entire domain, 443
 - subdomain, 443
- Baum, Carl E., 484
- Bessel functions, 295, 315, 597, 639
 - completeness, 615
 - functional relationships, 641
 - integral representations, 643
 - integrals involving, 645
 - large argument (asymptotic) approximations, 642
 - notation, 639
 - orthogonality, 640
 - power series representation, 642
 - recursion relationships, 643
 - series of, 645
 - small argument approximations, 642
 - spherical, 618
 - summation formulas, 644
 - Wronskians, 644
- Bessel's equation, 308, 597, 610, 618, 639
 - eigenfunctions, 597
 - eigenvalues, 597

- singularity, 597
- bianisotropic material, 28, 81, 84, 87, 89, 252, 258
- biconical antenna, 328
- biconical transmission line, 327
 - characteristic impedance, 328
- biisotropic material, 28
- Biot, Jean-Baptiste, 2
- Biot–Savart law, 169
 - applied to circular loop, 162
- birefringence, 32
- bistatic RCS, 474
- Boffi, L. V., 44
- Boltzmann, Ludwig Eduard, 19
- boundary condition(s), 20, 61, 123, 165, 241
 - electrostatic potential, 123
 - at a dipole layer, 153
 - Boffi form, 123
 - for a half-plane, 342
 - for phasor fields, 241
 - frequency-domain, 197
 - homogeneous, 593
 - impedance, 254
 - magnetic scalar potential, 165
 - moving surface, 68
 - normal electric flux density, 63
 - electrostatics, 123
 - normal magnetic flux density, 63
 - magnetostatics, 165
 - perfect electric conductor, 67
 - perfect magnetic conductor, 67
 - periodic, 593
 - postulate, 64
 - Poynting vector, 86, 249
 - time-average, 249
 - steady current, 123
 - tangential electric field, 62
 - electrostatics, 123
 - tangential magnetic field, 62
 - magnetostatics, 165
 - using equivalent sources, 67
 - vector potential, 165, 166
 - waveguide
 - TE modes, 392
 - TM modes, 392
- boundary value problem, 315, 320, 336, 445, 592
- boundary values
 - in solution to Poisson's equation, 136
 - used in duality, 71
- branch cut, 338, 344
- branch point, 332, 338, 344
- Brewster angle, 291
- Brillouin diagram, 354
- capacitance coefficients, 189
- cascaded system, 347
- Cauchy principal value, 568
- Cauchy's residue theorem, 332, 338, 344, 567
- Cauchy–Goursat theorem, 201, 566
- causality, 5, 25, 31, 42, 98, 107, 198, 200, 560
- cavity resonator
 - spherical, 621
- cell, 345
- characteristic impedance, 328
- charge, 5
 - conservation of, 6, 12
 - density, 7
 - dipole layer, 151
 - equilibrium in a conductor, 118, 122, 143
 - equivalent Poisson–Kelvin, 46
 - equivalent polarization, 46
 - equivalent polarization surface, 68, 222
 - Hertzian dipole, 379
 - invariance, 23
 - line, 7
 - electrostatic force on, 141
 - electrostatic potential of, 132
 - magnetic, 17, 59
 - near an edge, 154
 - positive and negative, 5
 - quantization, 6
 - surface, 7
 - volume, 7
- charge density, 7
 - line, 11
 - singular, 12
 - surface, 10
- charging by friction, 5
- check (\hat{a}), 1
- chiral material, 28, 33
- chirality parameter, 33
- chioplasma, 28
- Chu, L.J., 415
- circular polarization, 278
- Clausius, Rudolf Julius Emanuel, 223

- Clausius–Mosotti formula, 223
 clockwise polarization, 276
 closed system, 80
 coefficients of inductance, 190
 Cole, K.S., 231
 Cole, R.H., 231
 Cole–Cole diagram, 231
 Cole–Cole equation, 231
 Cole–Cole parameter, 231
 collision frequency, 214, 233, 272
 collocation, 442
 complementary solution, 460, 509
 complete set, 442, 443, 594, 615
 complex function, 565
 - analyticity, 565
 - differentiability, 565
 - limit of, 565
 - singular point, 565
- complex permittivity, 199, 206
 - of a plasma, 216
- complex Poynting theorem, 248
 complex Poynting vector, 245
 complex wavenumber, 259
 conducting material, 31
 conduction current, 9, 117, 199
 conductivity, 31, 117
 - conductor model, 233
 - dc, 200, 203, 233
 - dyadic, 32
 - of a plasma, 215
- conductor(s), 31
 - charge equilibrium, 118
 - good, 31, 279
 - grounded, 118, 133, 136, 140, 153, 185
 - perfect electric, 31, 75
 - perfect magnetic, 31
 - plasma model, 233
- cones
 - current on, 328
 - in solution to Laplace's equation, 619
 - spherical wave between, 327
- conformal mapping, 126
 conservation of electromagnetic momentum, 82
 conservation of energy
 - electromagnetic, 83
 - gravitational, 121
 - mechanical, 81
- conservation of linear momentum, 78
 conservative field, 121
 constitutive relations, 4, 26, 27, 213
 - biisotropic material, 33
 - for a dispersive material, 198
 - for a plasma, 215
 - for time-harmonic fields, 239
 - free space, 29
 - frequency symmetry, 198
 - frequency-domain, 198
 - linear anisotropic material, 32
 - linear isotropic material, 30
 - nonlinear material, 33
 - nonstationary, 31
 - perfect conductors, 31
 - phasor form, 240
 - rotating or deforming medium, 44
 - secondary, 58
 - transformation, 42
 - used in duality, 71
- continuity equation, 13, 21
 - applied to relaxation, 119
 - magnetic, 59
 - phasor form, 240
- contour deformation, 567
 contour integral, 565
 contour of integration, 332, 567
 convection current, 9
 convective derivative, 583
 convergence in mean, 595
 convolution theorem, 561
 convolutional kernel, 440
 coordinate systems, 631
 - cylindrical, 633
 - rectangular, 631
 - spherical, 635
- correction term, 378
 Coulomb gauge, 364
 Coulomb's law, 42, 131
 Coulomb, Charles-Augustin de, 2
 counterclockwise polarization, 276
 coupling coefficient, 487, 490
 covariance, 23, 38, 41, 44, 46
 creeping wave, 409
 critical angle, 289, 290
 - attenuation constant, 292
- critical frequency, 230
 crystal(s), 32
 - biaxial, 33
 - negative uniaxial, 33
 - positive uniaxial, 32
- curl theorem, 624

- current density, 8
 - line, 11
 - singular, 12
 - surface, 11
- current(s), 8
 - atomic, 233
 - conduction, 9, 117, 199
 - convection, 9
 - displacement, 3, 50, 279
 - electrolytic, 9
 - equivalent Amperian, 45
 - equivalent magnetic surface, 67
 - equivalent magnetization, 45
 - equivalent polarization, 45, 85
 - filamentary, 174
 - flux of, 9
 - Hertzian dipole, 379
 - impressed, 199, 372, 425, 430
 - input, 428
 - magnetic, 59
 - Hertzian dipole, 380
 - impressed, 372
 - natural mode expansion, 485
 - primary, 9, 370
 - secondary, 9, 199, 214, 218, 220, 341, 370
 - standing-wave, 425
 - steady, 119
 - integral properties, 120
- cutoff frequency, 269, 272, 392
 - of a rectangular waveguide, 399
- cutoff wavenumber, 391
- cylinder(s)
 - coaxial
 - stored magnetic energy, 178
 - conducting
 - integral equation for, 524
 - scattering from, 318
 - integral equation for
 - TE case, 530
 - TM case, 527
 - magnetic field integral equation for, 537
 - material
 - integral equation for, 541
 - scattering from, 315, 541
 - scattering width, 546
 - split, 612
 - square, 548
- cylindrical coordinate system, 633
- cylindrical wave
 - nonuniform, 316, 319, 320
 - phase constant, 310
 - phase velocity, 310
 - power carried by, 311
 - uniform, 100, 308, 312
 - wavelength, 310
- cylindrical wavefronts, 310
- D'Alembert solution, 574
- damping coefficient, 489
- damping parameter, 237
- Debye equation, 229
- Debye, Peter Joseph William, 229, 408
- decomposition
 - electric-magnetic source, 69
 - hermitian, 592
 - of electromagnetic systems, 77
 - solenoidal-lamellar, 362
 - spatial Fourier, 331
 - spatial symmetry, 357
 - TE-TM, 72, 387
 - in spherical coordinates, 400
 - transverse-longitudinal, 386
 - identities, 627
- deconvolution, 444
- deforming medium, 44
- degenerate modes, 399, 621
- del operator, 1
- delta function
 - Fourier transform, 629
 - Kronecker, 605
- demagnetizing field, 235
- density function, 12
- depolarizing dyadic, 378
 - for a cubical volume, 379
 - for a spherical volume, 379
- derivative
 - convective, 583
 - material, 583
 - partial, 583
 - total, 584
- derivative identities, 625
- diamagnetic material, 233
- dielectric, 220
 - good, 31
 - perfect, 30
- differential equation(s)
 - Bessel, 597, 610, 618, 639
 - for spherical harmonics, 649

- harmonic, 595
- Helmholtz, 599
- Legendre, 597, 646
- differential operations
 - cylindrical coordinates, 634
 - rectangular coordinates, 632
 - spherical coordinates, 637
- diffraction
 - by a half-plane, 345
- dipole, 17
 - Hertzian, 72
- dipole antenna, 425, 464
 - current distribution, 469
 - far-zone fields, 427
 - input impedance, 467
 - radiated power, 428
 - radiation resistance, 428
- dipole layer, 151
- dipole moment, 146, 173, 213, 380
 - induced, 221
 - of a dielectric, 221
 - of a planar loop, 163
 - permanent, 221, 229
 - potential, 163
 - surface density, 151
 - vector, 163
 - volume density, 165
- dipole polarization, 221
- Dirac delta, 562
- directional weighting function, 424, 425
 - of a dipole antenna, 427
 - of a waveguide aperture antenna, 436
 - of an aperture antenna, 434
- Dirichlet Green's function, 133
- discontinuities
 - spatial, 61
- dispersion, 88, 198, 208, 216, 226, 295, 393
 - anomalous, 228, 269
 - normal, 227, 269
 - radiative, 472
- dispersion diagram, 269, 306
 - for a waveguide, 393
- dispersion formula for classical physics, 226
- dispersion relation, 226
 - Debye medium, 229
- displacement current, 50, 279
- displacement vector, 1
 - identities, 626
- divergence theorem, 623
- domain, 439
 - dominant mode, 400
 - drift velocity, 120
 - dual problems, 70, 256
 - duality, 70, 261, 314
 - frequency domain, 256
 - point sources, 72
 - source-free region, 73, 257
 - dyad, 587, 588
 - dyadic Green's function, 378
 - electric, 376
 - magnetic, 376
 - dyadic polynomial, 589
 - dyadic(s), 587
 - algebra of, 590
 - anterior and posterior products, 589
 - anti-hermitian, 592
 - antisymmetric, 591
 - calculus of, 590
 - component representation, 587
 - conductivity, 32
 - cylindrical coordinate formulas, 634
 - depolarizing, 378
 - for a cubical volume, 379
 - for a spherical volume, 379
 - hermitian, 591
 - identities, 623
 - permeability, 32
 - permittivity, 32
 - rectangular coordinate formulas, 631
 - spherical coordinate formulas, 636
 - symmetric, 591
 - unit, 591
 - vector representation, 589
- E mode, 388
- early time period, 484, 497
- Earnshaw's theorem, 117, 182
- echo area, 408
- edge
 - charge singularity, 154
 - current near, 324
 - current singularity, 324
 - electrostatic potential near, 154
- eigenfunction, 593, 601
 - complete set, 594
 - orthogonality, 594
 - uniqueness, 595
- eigenfunction expansion, 441, 594
- eigenmodes, 391
- eigenvalue, 347, 391, 441, 593, 601

- spectrum, 593
- Einstein, Albert, 2, 3, 41, 268, 366
- electret, 150, 221
- electric charge, 5
 - conservation of, 6, 12
 - invariance of, 6
 - quantization, 6
- electric current, 8
 - density, 8
- electric dipole, 243
- electric displacement, 22
- electric excitation, 22
- electric field integral equation, 450, 461, 477, 503, 509, 527
- electric field strength, 22
- electric flux density, 22
- electric intensity, 22
- electric polarization, 261, 308
- electric susceptibility, 30, 48
 - of a plasma, 216
- electric wall, 359
- electrolytic current, 9
- electromagnetic field, 20, 23
 - dynamic coupling, 115
- electromagnetic momentum, 22, 23
- electromagnetic power, 23
- electromagnetic radiation, 88
- electromagnetics
 - free-space, 7
 - macroscopic, 6
- electromotive force, 22, 45, 49, 51, 174
 - motional, 53
- electron beam, 214
- electron cyclotron frequency, 218
- electron density, 272
- electronic polarization, 221
- electrostatic potential, 121
- electrostatic shielding, 134
- elliptic integral, 161
- elliptical polarization, 278
- empirical-inductive viewpoint, 19
- energy
 - assembly, 121, 143, 176
 - chemical, 199
 - conservation of, 12
 - conservation of electromagnetic, 83
 - conservation of mechanical, 81
 - density, 84, 85
 - dissipated, 205
 - kinetic, 216
 - mechanical, 199
 - stored electric, 144, 183, 205, 211, 248, 397
 - stored electromagnetic, 205, 209
 - stored magnetic, 177, 205, 211, 248, 397
 - between cylinders, 178
 - thermal, 173, 199
 - velocity, 281
- energy theorem, 213
- energy velocity, 268, 397
- entire domain function, 443
- entire function, 344, 486
- entities of intensity, 22, 58
- entities of quantity, 22, 58
- equation of continuity, 13
- equipotential surface, 122
- equivalence principle
 - Love's, 431
 - Schelkunoff's, 432
- equivalent magnetic surface current, 67
- equivalent magnetization charge, 159
- equivalent magnetization current, 45, 160
 - impressed, 372
 - physical interpretation, 164
- equivalent magnetization surface charge, 165
- equivalent polarization charge, 46
 - of a dielectric sphere, 156
- equivalent polarization current, 45, 85
 - impressed, 367, 372
- equivalent polarization surface charge, 68, 222
- evanescent wave, 272, 293, 335, 336, 390, 396
 - in a waveguide, 393
- Ewald-Oseen extinction theorem, 421
- excluded region, 420
- existence, 24
- expansion in spherical harmonics, 651
- extinction theorem, 421
- far zone, 423
- far-zone fields, 381, 407, 420
 - and radiated power, 425
 - general formulation, 423
 - of a conducting cylinder, 528, 532
 - of a conducting strip, 510
 - of a dipole antenna, 427
 - produced by equivalent sources, 434

- TEM behavior, 424
- far-zone vector potential, 424
- Faraday rotation, 307
- Faraday's law, 21
 - for static fields, 121
 - frequency-domain, 197
 - initial conditions, 22
 - integral form, 49
 - invariance, 39
 - kinematic form, 52
 - phasor form, 240
 - with magnetic sources, 59
- Faraday, Michael, 2
- fast Fourier transform, 472, 493, 498
- ferrimagnetic material, 234
- ferrite
 - dispersion diagram, 306
- ferromagnetic material, 234
- field concept, 2
- field terminology, 22
- finite difference technique, 126
- finiteness conditions, 420
- Floquet's theorem, 345
- flux, 2
 - magnetic, 52, 59
 - tube, 174
- flux density
 - electric, 22
 - magnetic, 22
- flux vector, 45
- force
 - Ampere's law of, 171, 174
 - between line charges, 141
 - between two current-carrying wires, 171
 - using Maxwell's stress tensor, 172
 - density, 79
 - electric, 140
 - volume density, 140
 - electromotive, 45
 - electrostatic, 5
 - frictional, 225
 - gravitational, 77
 - Lorentz, 4, 58, 77, 82, 83, 106, 117, 119, 121, 170, 213, 218, 224
 - magnetomotive, 45
 - mechanical, 78
 - on a current-carrying wire, 170
 - restoring, 225, 233
 - volume density, 78
- force vector, 45
- form invariance, 44
- forward problem, 24
- Fourier integral theorem, 136, 138, 330, 340, 361, 560
- Fourier series, 345, 480
 - generalized, 594
 - Gibb's phenomenon, 595
- Fourier transform, 126, 238, 559
 - applied to integral equations, 441
 - existence, 559
 - generalized, 562
 - in derivation of three-dimensional Green's function, 578
 - in solution of one-dimensional wave equation, 569
 - in solution of one-dimensional wave equation for dissipative media, 575
 - in solution of Poisson's equation, 136
 - integral
 - one-dimensional, 559
 - two-dimensional, 563
 - inversion integral, 559, 564
 - of separable functions, 564
 - properties
 - causal function, 560
 - conjugate function, 560
 - convolution, 561
 - differentiation, 562
 - integration, 562
 - linearity, 560
 - null function, 561
 - Parseval's identity, 562
 - real function, 560
 - reflection symmetry, 560
 - shifting, 561
 - similarity, 561
 - symmetry, 560
 - time/band-limited function, 561
 - spatial, 329
 - tabulated transform pairs, 629
 - temporal, 195, 472
 - two-dimensional, 330
- Fourier-Bessel series, 597, 645
- Fourier-Bessel transform, 564, 565
 - inversion, 565
- Fourier-Legendre series, 598, 620, 649
- fractional volume, 224
- frame of reference, 23, 38, 47, 49, 117
- Franklin, Benjamin, 5
- Franz formula, 430, 431

- Fredholm integral equation, 439, 446, 450, 454, 461
- free space
 intrinsic impedance, 30
 permeability, 29
 permittivity, 29
- frequency
 collision, 214, 233, 272
 critical, 230
 cutoff, 269, 272, 392, 399
 electron cyclotron, 218
 gyromagnetic response, 236
 Laplace, 486
 Larmor precessional, 234
 plasma, 215, 226
 resonance, 226, 307
 saturation magnetization, 236
 spatial, 559
 temporal, 559
- frequency spectrum, 196, 559
- Fresnel coefficients, 288
- frill model, 466
- fundamental equations, 22
- fundamental fields, 46, 58
- Galerkin's method, 444
- Galilean transformation, 35, 51
- Galileo Galilei, 75
- gauge
 Coulomb, 160, 364
 Lorentz, 366
- gauge transformation, 13, 159, 363, 365
- Gauss's law, 21
 frequency-domain, 197
 integral form, 51
 invariance, 40
 phasor form, 240
 with magnetic sources, 59
- Gauss, Johann Carl Friedrich, 3
- generalized Fourier transform, 562
- geometrical optics, 345, 408
- Gibb's phenomenon, 595
- Gibbs, Josiah Willard, 587
- global reflection coefficient, 298, 300
- good conductor, 31, 279
- good dielectric, 31, 278
- Goos-Hänchen shift, 293
- gradient theorem, 624
- Gram-Schmidt orthogonalization, 595
- Green's first identity, 396
 for scalar fields, 624
 for vector fields, 624
- Green's function(s), 127, 373
 average, 460, 477
 Dirichlet, 133
 dyadic magnetic, 376
 electric dyadic, 376
 electrostatic potential, 128
 for a sphere, 140
 general solution, 129
 reciprocity, 134
 two-dimensional, 132
 unbounded space, 131
 far-zone, 424
 Laplace domain, 486
 Neumann, 134
 periodic, 349
 primary, 136
 reciprocity of, 128, 383
 secondary, 137
 static, 581
 Fourier transform approach, 580
 three-dimensional, 375, 500
 Fourier transform approach, 578
 time-domain, 374
 two-dimensional, 131, 313, 500
 spectral representation, 337
- Green's reciprocity theorem, 140, 185
- Green's second identity, 128
 for scalar fields, 624
 for vector fields, 624
- Green's second identity for vector fields, 167
- Green's theorem, 373, 624
- ground, 118, 122
- group velocity, 267, 269, 281
 in a good conductor, 280
 in a periodic structure, 346
 in a waveguide, 393
- guided wavelength, 394
- gyromagnetic ferrite, 237
- gyromagnetic material, 234
- gyromagnetic property, 234
- gyromagnetic ratio, 234
- gyromagnetic response frequency, 236
- gyrotropic material, 219, 253
- H mode, 388
- half-plane, 154
 field scattered by, 345

- scattering from, 341
- Hallén's equation, 461
 - for a conducting strip, 509
 - for curved wires, 477
 - for natural mode currents, 488
 - time-domain, 496
- Hallén, Erik G., 461, 480, 496
- Hankel functions, 309, 313, 503, 610
 - spherical, 407
- harmonic differential equation, 595
 - eigenfunctions, 596
 - eigenvalues, 596
- harmonic oscillator, 225
- Hartree harmonics, 346
- Helmholtz decomposition, 362
- Helmholtz equation, 259, 579, 599, 600
 - eigenfunctions, 599
 - eigenvalues, 599
 - for electric scalar potential, 371
 - for electric vector potential, 371
 - for magnetic scalar potential, 371
 - for magnetic vector potential, 371
 - for nonradiating sources, 328
 - Fourier transform solution, 333
 - polar coordinates, 335
 - separability, 601
 - separation of variables
 - cylindrical coordinates, 635
 - rectangular coordinates, 632
 - spherical coordinates, 637
 - two-dimensional, 260
- Helmholtz theorem, 625
- Helmholtz transport theorem, 586
- Helmholtz, Hermann Ludwig Ferdinand von, 75
- hermitian decomposition, 592
- hermitian kernel, 440
- hermitian matrix, 220, 237, 247
- Hertz, Heinrich Rudolf, 3, 19, 88
- Hertzian dipole, 72, 379, 415
 - electric vector potential of, 380
 - electromagnetic fields of, 380
 - magnetic, 380
 - radiated power, 381
 - radiation resistance, 381
- Hertzian potential, 367, 369, 431
 - representation of TE/TM fields, 388
 - representation of TEM field, 389
- Hilbert transform, 204, 561
- Hilbert, David, 19
- homogeneous integral equation, 440
- homogeneous medium, 27
- horizontal linear polarization, 278
- Huygens, Christiaan, 429
- hysteresis, 177
- ill-conditioned matrix, 444
- illuminated region, 505
- image, 134, 135, 137, 139, 359
 - identified using symmetry, 359
 - of a line source, 341
- impedance boundary condition, 254
- impedance sheet, 75
- impressed current, 425, 430
- impressed field, 127, 155, 448, 457, 471, 477, 481, 497
 - models for, 464
- impressed magnetization current, 372
- impressed polarization current, 367, 372
- impressed source, 90, 93, 205, 257, 339, 367, 372, 415
- impulse function
 - Fourier transform, 629
- incidence angle, 284
- inductance
 - coefficients, 190
 - Neumann's formula, 190
- induction fields, 380
- inertial reference frame, 34
- inhomogeneous medium, 27
- initial conditions, 22
- input admittance, 481
- input current, 428
- input impedance, 248, 328, 465
- instantaneous rest-frame theory, 44
- insulator, 220
- integral equation(s), 439
 - classification
 - electric field integral equation, 450
 - first kind, 440
 - Fredholm, 439
 - magnetic field integral equation, 526
 - second kind, 440
 - Volterra, 440
 - direct solution, 441
 - domain of, 439
 - dual, 343
 - eigenfunction expansion, 441
 - for a circular loop, 480
 - for a conducting cylinder, 524

- magnetic field integral equation, 537
 - for a conducting strip, 503
 - Hallén's equation, 509
 - for a layered medium, 454
 - for a material cylinder, 541
 - for a penetrable body, 450
 - for a perfectly conducting body, 450
 - for a resistive strip, 513
 - for a thin wire, 461
 - curved, 474
 - natural mode current, 486
 - for a waveguide, 517, 521
 - for an inhomogeneous layered medium, 450
 - Fourier series solution, 480
 - Galerkin's method, 444
 - Hallén's, 461, 477
 - homogeneous, 440
 - kernel of, 440
 - linear, 439
 - method of moments, 442
 - method of weighting functions, 443
 - numerical solutions, 441
 - operator form, 440
 - Pocklington, 477
 - successive substitution, 441
 - time-domain, 495
- integral theorems, 623
- integral transform, 195
- interfacial reflection coefficient, 298, 454
- interfacial transmission coefficient, 298
- internal impedance, 352, 513
- intrinsic impedance, 58, 96, 264
 - free space, 30
- invariance of charge, 6
- inverse Fourier transform, 332, 559
 - in polar coordinates, 335
- inverse problem, 24, 108
- inverse square law, 126, 131, 169
- inversion contour, 332, 338, 343
- inversion integral
 - in polar coordinates, 335
- ionosphere, 88, 218, 272
 - plane wave in, 272
- isotropic material, 28, 119, 126, 158, 206
- iteration, 441
- Joule heating, 173, 174, 205, 268, 274
- Joule's law, 173
- jump conditions, 5, 20, 61
- kernel(s), 440
 - convolutional, 440
 - Fourier series expansion of, 480
 - Hallén's, 478
 - hermitian, 440
 - Pocklington, 477
 - positive definite, 440
 - separable, 440
 - singular, 440
 - symmetric, 440
 - thin-wire, 463
- Kirchhoff approximation, 437
- Kirchhoff's laws, 3
- Kramers, Hendrik Anthony, 204
- Kronecker delta function, 605
- Kronig, Ralph de Laer, 204
- Kronig-Kramers relations, 31, 204, 208
 - applied to a plasma, 217
 - applied to a resonant material, 228
- laboratory frame, 34, 41, 47, 49, 51, 57, 60, 68
- Lagrange's identity, 593
- Lagrangian density function, 87
- lamellar field, 362, 363
- Laplace transform, 486
- Laplace's equation, 126
 - applied to an edge, 153
 - for bodies in an impressed field, 155
 - solved using separation of variables, 603, 611, 619
 - uniqueness, 127
- Laplacian
 - longitudinal, 385
 - transverse, 329, 331, 385
- Larmor precessional frequency, 234
- late time period, 484
- Laurent series, 565
 - convergence, 566
 - principal part, 566
 - regular part, 566
- law of reflection, 289
- law of refraction, 290
- layered medium, 296, 347
- least squares, 444
- left-hand polarization, 276
- Legendre functions, 156, 180, 598, 600, 617, 645
 - addition formula, 648
 - functional relationships, 647

- integral representations, 648
- integrals involving, 649
- limits, 649
- notation, 645
- orthogonality, 646
- power series representation, 648
- recursion relationships, 648
- summations, 648
- Legendre polynomials, 150, 598
- Legendre's equation, 597, 617, 646
 - eigenfunctions, 598
 - eigenvalues, 598
 - singularity, 598
- light, 88
- light line, 269
- line charge density, 11
- line current
 - Biot–Savart law applied to, 169
 - electromagnetic fields of, 313
 - force on, 171, 172
 - torque, 172
- line current density, 11
- line source, 320
 - above an interface, 339
 - electric
 - angular spectrum, 337
 - fields found using Fourier transform, 336
 - fields of, 313, 501
 - image, 341
 - magnetic
 - fields found using Fourier transform, 337
 - fields of, 313
 - periodic, 348
- linear operator, 372, 440, 593
 - self-adjoint, 593
- linear polarization, 278
 - horizontal, 278
 - vertical, 278
- linearity, 69, 560
- Liouville's theorem, 344
- local field, 223
- longitudinal field, 386, 387, 390
- longitudinal Laplacian, 385
- longitudinal vector component, 384
- loop
 - antenna, 479
 - hysteresis, 177
 - magnetic dipole moment, 162, 163
 - static magnetic field, 161
 - torque on, 173
 - vector potential, 161
- Lorentz condition, 370, 371
- Lorentz force equation, 23
 - invariance, 41
- Lorentz gauge, 366
- Lorentz invariant, 41
- Lorentz lemma, 74
- Lorentz reciprocity theorem, 73, 253, 415
- Lorentz transformation, 38, 42, 45, 51, 58
 - first order, 38, 47, 57
- Lorentz's lemma, 253
- Lorentz, Hendrik Antoon, 46, 58, 63, 222–224
- Lorentz–Lorenz formula, 223
- Lorenz, Ludvig Valentin, 223
- loss tangent, 231, 278, 392
- lossless material, 245
- lossy material, 245
- Love's equivalence principle, 431
- macroscopic electromagnetics, 213
- magnetic charge, 17, 59
- magnetic current, 59
- magnetic dipole, 162, 243
- magnetic dipole moment, 162
- magnetic excitation, 22
- magnetic field integral equation, 526, 535, 539
- magnetic field strength, 22
- magnetic flux, 52
- magnetic flux density, 22
- magnetic force, 22
- magnetic Gauss's law, 21
- magnetic induction, 22
- magnetic intensity, 22
- magnetic line current
 - fields of, 313
- magnetic line source, 323
- magnetic moment, 233
 - orbital, 233
 - spin, 233
- magnetic monopole, 17, 59, 162
- magnetic polarization, 261, 308
- magnetic scalar potential, 157
- magnetic susceptibility, 30
 - dyadic, 236
- magnetic vector potential, 159
- magnetic wall, 32, 359

- magnetization, 242
- magnetization vector, 44
- magnetoelectric effects, 28
- magnetomotive force, 45, 49
- marching on in time, 495
- Maricourt, Pierre de, 17
- match point, 442
- matched layers, 301
- material
 - active, 216, 245
 - anisotropic, 28, 198, 200, 211, 219, 246
 - lossless, 207
 - antiferromagnetic, 28, 234
 - bianisotropic, 28, 58, 81, 84, 87, 89, 252, 258
 - biisotropic, 28, 33, 58
 - chiral, 28, 33
 - chiroferrite, 28
 - chiroplasma, 28
 - crystal, 32
 - Debye, 229
 - diamagnetic, 233
 - dielectric, 220
 - dispersive, 31, 85, 198, 208, 258
 - dissipative, 199, 205, 206, 208
 - ferrimagnetic, 234
 - ferrite, 32, 234
 - damping parameter, 237
 - plane wave in, 304
 - ferromagnetic, 234
 - good dielectric, 278
 - gyromagnetic, 234
 - gyrotropic, 32, 207, 219, 253
 - lossless, 237
 - homogeneous, 27
 - ideal, 27
 - inhomogeneous, 27, 450
 - insulator, 30
 - isotropic, 28, 119, 126, 158, 206
 - layered, 284
 - inhomogeneous, 450
 - linear isotropic, 30
 - lossless, 207, 211, 216, 245
 - lossy, 245
 - multi-layered, 296
 - non-reciprocal, 307
 - nonstationary, 27
 - paramagnetic, 233
 - passive, 230, 246, 264
 - plasma, 32
 - reciprocal, 74
 - resonant, 226
 - spatially dispersive, 27
 - stationary, 27
 - temporally dispersive, 27
- material derivative, 13, 583
- Maxwell's equations
 - alternative forms, 54
 - alternative kinematic forms, 54
 - Boffi form, 30, 44, 56
 - kinematic forms, 57
 - large-scale forms, 56
 - compared for static fields, 157
 - definite form, 24, 30
 - for symmetric sources and fields, 358
 - form invariance, 23, 34, 37, 54
 - frequency-domain, 196
 - indefinite form, 24
 - integral forms, 50
 - interdependence, 21
 - large-scale forms, 50
 - Minkowski form, 21
 - moving, deforming surfaces, 55
 - phasor form, 240
 - postulate, 19, 63
 - static decoupling of fields, 116
 - static electric field, 116
 - Boffi form, 116
 - static magnetic field, 116, 157
 - Boffi form, 116
 - Stratton–Chu solution, 415
 - with magnetic sources, 59
- Maxwell's stress tensor, 81, 97
 - electrostatic case, 140
 - magnetostatic case, 172
- Maxwell, James Clerk, 3, 19, 22, 45, 84
- Maxwell–Boffi equations, 44
- Maxwell–Garnett mixing formula, 224
- Maxwell–Minkowski equations, 20, 21
- mean value theorem of electrostatics, 182
- mechanical stress tensor, 78
- mediating field, 4, 20
- medium
 - chiral, 33
 - Debye, 229
 - dissipative, 205
 - gyrotropic, 207, 219
 - homogeneous, 27
 - inhomogeneous, 27

- lossy, 251
- multi-layered, 296, 347
- nonstationary, 27
- passive, 246
- reciprocal, 253
- spatially dispersive, 27
- stationary, 27
- synthetic, 33
- temporally dispersive, 27
- Mei, Kenneth Kwai-Hsiang, 477
- method of moments, 126, 442
 - applied to a conducting cylinder
 - magnetic field integral equation, 540
 - TE case, 530
 - TM case, 527
 - applied to a conducting strip
 - TE case, 509
 - TM case, 503
 - applied to a material cylinder, 543
 - applied to a resistive strip, 513
 - applied to a square material cylinder, 548
 - applied to a thin wire, 461
 - natural mode current, 489
 - scattering, 469
 - applied to a transmission line, 446
 - applied to a waveguide
 - TE modes, 522
 - TM modes, 517
 - applied to an inhomogeneous layered medium, 455
 - collocation, 442
 - convergence, 456, 467, 548, 549
 - matrix symmetry, 462
 - self terms, 462
 - singularity extraction, 462
- method of steepest descents, 338
- Michelson, Albert Abraham, 3
- Michelson-Morely experiment, 3
- Mie scattering, 408
- Mie, Gustav Adolf Feodor Wilhelm Ludwig, 408
- Minkowski, Hermann, 20, 23, 42
- mixing formula
 - for dielectrics, 224
 - Maxwell-Garnett, 224
 - Rayleigh, 224
- mixture
 - of dielectrics, 223
- mobility, 120
- modal amplitude, 486
- modes, 391
 - degenerate, 399
 - natural oscillation, 484
- molecular polarization, 221
- momentum
 - angular, 80, 234
 - conservation of, 12
 - conservation of electromagnetic, 82
 - conservation of linear, 78
 - density, 78
 - density of electromagnetic, 82
 - kinetic density of, 79
 - mechanical, 78, 214
- monochromatic field, 238, 268
- monopole, 17
- monostatic scattering, 408
- Morely, Edward Williams, 3
- Morera's theorem, 201, 343
- Mosotti field, 223, 225
- Mosotti, O.F., 223
- motional emf, 53
- multi-layered medium, 296, 347
- multipole expansion, 144
 - applied to spherical charge distribution, 148
 - for electromagnetic fields, 382
 - in spherical harmonics, 147
 - of the vector potential, 162
- multipole moments, 145, 221
- mutual capacitance, 190
- natural frequency, 487, 489
- natural mode, 484
 - current expansion, 485
 - series, 485
- natural oscillations, 485
- natural resonance, 484
- near-zone fields, 88, 380
- Neumann Green's function, 134
- Neumann series, 441
- Neumann's formula, 190
- Neumann's number, 317, 322, 613
- Newton, Isaac, 2
- non-reciprocal material, 307
- nonconservative field, 158
- nonradiating sources, 103, 106, 325, 328
 - spherically-symmetric, 329
- nonstationary medium, 27

- nonuniform cylindrical wave, 314, 316, 319, 320
- nonuniform plane wave, 282, 287, 295, 334
- nonuniform spherical wave, 325
- normal dispersion, 227, 269
- nuclear electromagnetic pulse, 97, 107
- number density, 213, 221, 223, 235

- Oersted, Hans Christian, 2
- Ohm's law, 3, 9, 31, 117
- optical axis, 33
- optical limit, 505
- optical scattering, 408
- ordinary points, 21
- orientation polarization, 221
- orthogonality
 - of basis functions, 444
 - of Bessel functions, 616, 640
 - of eigenfunctions, 594
 - of Legendre functions, 646
 - of spherical harmonics, 650
 - of the cosine function, 613
 - of the sine function, 605, 607, 613
 - of waveguide modes, 394

- parallel polarization, 285, 297
- paramagnetic material, 233
- Parseval's identity, 562
- particular solution, 460, 509
- passband, 348
- passive material, 230, 246, 264
- passive medium, 204
- perfect dielectric, 30
- perfect electric conductor, 31, 75
- perfect insulator, 30
- perfect magnetic conductor, 31
- periodic fields, 345
- periodic Green's function, 349
- periodic line source
 - fields of, 349
- permanent dipole moment, 221, 229
- permanent magnet, 159, 178
- permanent magnetic moment, 234
- permeability, 30
 - dyadic, 32, 236
 - Kronig-Kramers relations for, 204
 - of a ferrite, 236
 - of free space, 29
 - relative, 30
- permittivity, 30
 - complex, 199, 259
 - dyadic, 206
 - frequency symmetry, 200
 - dyadic, 32
 - symmetry, 220
 - electrostatic, 200
 - frequency dependence, 200
 - Kronig-Kramers relations for, 204
 - of a conductor, 233
 - of a magnetized plasma, 219
 - of a plasma, 215
 - of free space, 29
 - optical, 230
 - relative, 30
 - static, 226, 230
- perpendicular polarization, 285, 297
- phase constant, 264
 - in a waveguide, 392
- phase velocity, 267, 269, 274, 327
 - in a good conductor, 280
 - in a periodic structure, 346
 - in a plasma, 273
 - in a waveguide, 393
- phasor, 208, 240
- physical optics
 - applied to a conducting cylinder, 528, 532
 - scattering width, 528, 532
 - applied to a strip, 505, 511
 - scattering width, 506
- planar field symmetry, 357
- plane wave, 262
 - amplitude spectrum, 262
 - angular spectrum, 334
 - attenuation, 268
 - attenuation constant, 264
 - decomposition in spherical coordinates, 404
 - electric field, 262
 - evanescent, 335, 336
 - group velocity, 267
 - identities, 626
 - in a good conductor, 279
 - in a good dielectric, 278
 - in a periodic medium, 347
 - in a plasma, 271
 - magnetic field, 263
 - nonuniform, 282, 287, 295, 334
 - phase constant, 264
 - phase velocity, 267, 274

- power carried by, 280
- reflected, 286
- superposition of, 309, 336, 340
- transient, 95, 293, 303
- transmitted, 286
- uniform, 263, 274, 289, 330
- wavelength, 275
- plane wave superposition, 309, 336, 340
- plasma, 32, 207, 213, 224, 269, 304
 - conductivity, 215
 - dispersion diagram, 272
 - dyadic permittivity, 219
 - lossless, 216, 218
 - magnetized, 218
 - model of a conductor, 233
 - permittivity, 215
 - plane wave in, 271
 - velocity, 214
- plasma frequency, 215, 226
- plates (conducting)
 - line source between, 360
- Pocklington's equation, 477
 - for a circular loop, 480
- Pocklington, Henry Cabourn, 477
- Poincaré sphere, 278
- Poincaré, Jules Henri, 278
- point matching, 443
- Poisson's equation, 126, 148, 363
 - for electric scalar potential, 365
 - for magnetostatics, 158
 - for vector potential, 160
 - solution for planar media, 135
 - uniqueness, 127
- Poisson's sum formula, 349
- polar molecule, 229
- polar vector, 58
- polarizability, 222
- polarization, 94, 242, 275
 - atomic, 221
 - circular, 278, 306, 307
 - deterministic, 275
 - dipole, 221
 - electric, 308
 - electronic, 221
 - linear, 278, 307
 - magnetic, 308
 - molecular, 221
 - orientation, 221
 - parallel, 285, 297
 - partial, 275
 - permanent, 150
 - perpendicular, 285, 297
 - random, 275
- polarization ellipse, 276
- polarization state, 277, 278
- polarization vector, 44, 220
 - physical interpretation of, 148
- polarizing angle, 291
- pole, 332, 338, 486, 489, 566
- pole series, 486
- position vector, 1
 - transverse, 260, 500
- positive definite kernel, 440
- potential
 - absolute electrostatic, 122
 - electric scalar, 364, 371
 - integral representation, 365
 - electric vector, 364, 371
 - electrostatic, 121
 - general solution, 129
 - Green's function, 128
 - near an edge, 154
 - of a line charge, 132
 - far-zone, 424
 - Hertzian, 367, 371, 431
 - in a bounded region, 384
 - in an unbounded region, 384
 - Laplace domain, 486
 - magnetic scalar, 368, 371
 - magnetic vector, 159, 368, 371
 - general solution, 168
 - integral representation, 160
 - magnetostatic, 157
 - mean value, 182
 - of a dipole layer, 151
 - of a Hertzian dipole, 380
 - primary, 135
 - reference, 13
 - scalar, 363
 - scattered, 449
 - secondary, 136
 - vector, 362
- potential difference, 121
 - magnetostatic, 157
- power
 - carried by a waveguide mode, 395
- power density, 280
- power pattern, 425
- Poynting theorem, 83, 204, 241, 245
 - and stored electric energy, 144

- applied to a cylindrical wave, 103, 311
- applied to a Hertzian dipole, 381
- applied to a plane wave, 97
- applied to a spherical wave, 105, 327
- applied to a waveguide, 396
- applied to a wire, 173
- applied to nonradiating sources, 106
- complex, 247, 248
- for time-harmonic fields, 242
 - nondispersive material, 244
- steady currents, 173
- Poynting vector, 84
 - and far-zone fields, 425
 - complex, 245
 - time-average, 245
- Poynting, John Henry, 83
- precession, 234
- pressure
 - electromagnetic, 97
 - mechanical, 77, 80
- Priestly, Joseph, 2
- primary current, 9
- primary Green's function, 136
- primary potential, 135
- principal axes, 32
- principal part, 566
- principal-value integral, 204, 217, 374, 377, 378, 540, 568
- principle of Ampere and Lorentz, 44
- principle of duality, 70
 - frequency domain, 256
- principle of linear momentum, 78
- principle of superposition, 69
- product solution, 601
- progressive phase shift, 348
- propagation constant, 392
- purely electric fields, 41
- purely magnetic fields, 41
- Q, 489
- quadrupole moment, 147
- quantization of charge, 6
- quantum mechanics, 6, 213, 233
- quarter-wave transformer, 301
- quasistatic fields, 88
- radar cross section, 352
 - bistatic, 473
 - of a sphere, 408
 - or a thin wire, 474
- radar cross-sectional width, 505
- radiated power
 - from a dipole antenna, 428
 - from a Hertzian dipole, 381
- radiation condition, 328, 373, 375, 383, 420
- radiation damping, 409, 484, 486
- radiation fields, 381
 - of a Hertzian dipole, 381
- radiation function, 427
- radiation resistance, 381
 - of a dipole antenna, 428
- radiative dispersion, 472
- Rayleigh mixing formula, 224
- Rayleigh scattering, 408
- Rayleigh–Carson reciprocity theorem, 255
- reaction, 73, 253
- reaction theorem, 254
- reactive power, 248
- reciprocal medium, 74, 253
- reciprocal system, 254
- reciprocity, 73, 74, 134, 383, 462
 - Rayleigh–Carson, 255
 - reaction, 254
- reciprocity theorem, 73, 253
- rectangular coordinate system, 631
- rectangular pulse function, 563
 - Fourier transform, 629
- recursion, 298, 299
- recursion relation, 441
- reference point, 122
- reflection angle, 289
- reflection coefficient, 288, 292, 298, 300, 340, 453
 - global, 298, 300
 - load, 448
 - time-domain, 293
- regular function, 343
- regular part, 566
- relative permeability, 30
- relative permittivity, 30
- relaxation, 229
- relaxation spectrum, 229, 231
- relaxation time, 119, 229
- residual, 442
- residue, 333, 566
 - formula for evaluating, 566
- resonance, 227, 248
 - damped, 484
 - natural, 484

- of a circular loop, 482
- of a dipole antenna, 468, 474
- of a thin wire, 472
- resonance curve, 228
- resonance frequency, 226, 307
- resonance region, 408
- retarded potentials, 374
- Reynolds transport theorem, 13, 78, 80, 587
- Reynolds, Osborne, 75
- Riemann–Lebesgue lemma, 202
- right-hand polarization, 276
- right-hand rule, 175, 276
- Roentgen, Wilhelm Conrad, 43
- rotating medium, 44
- roundoff error, 444
- Rumsey, Victor H., 253
- saturation, 235
- saturation magnetization frequency, 236
- Savart, Félix, 2
- scalar Helmholtz equation, 196, 260
- scattered field, 155, 315, 320, 341, 362, 406, 448, 457
- scattering
 - from a conducting cylinder, 318, 524
 - from a conducting sphere, 406
 - from a conducting strip, 502
 - from a conducting wedge, 320
 - from a half-plane, 341
 - from a material cylinder, 315, 541
 - from a periodic surface, 345
 - from a planar surface, 341
 - from a resistive strip, 511
 - from a sphere
 - time-domain, 408
 - from a square material cylinder, 548
 - from a thin wire, 469
 - time-domain, 472, 493
 - Mie, 408
 - monostatic, 408
 - optical, 408
 - Rayleigh, 408
- scattering problem, 448
- scattering width, 505, 510
 - of a conducting cylinder, 528, 532
 - of a conducting strip, 506, 510
 - of a material cylinder, 546
 - of a resistive strip, 513, 514
 - of a square material cylinder, 549
- Schelkunoff equivalence principle, 432
 - applied to a screen with an aperture, 432
- Schelkunoff, Sergei Alexander, 64, 432
- secondary current, 9, 199, 214, 218, 220, 341
- secondary field, 155, 315, 320, 342
- secondary Green's function, 137
- secondary potential, 136
- secondary source, 90, 257, 429
- secondary source concept, 429
- self capacitance, 190
- self-adjoint linear operator, 593
- Sellmeier equation, 226
- separable kernel, 440
- separation argument, 602
- separation constants, 601
- separation of variables, 126, 153, 600
 - applied to Laplace's equation, 603, 611, 619
 - conditions for solvability, 601
 - cylindrical coordinates, 635
 - rectangular coordinates, 602, 632
 - separation argument, 602
 - spherical coordinates, 637
- shadow region, 505
- shielding
 - electrostatic, 134
 - magnetostatic, 181
- sifting property, 562
- signum function, 562, 563
 - Fourier transform, 629
- similarity parameters, 75
- similitude, 75
 - linear media, 76
- sinc function, 563
- singular kernel, 440
- singular matrix, 527, 531
- singularity, 105, 327, 332, 377, 462, 477, 481, 503, 518, 523, 536, 565, 594, 597, 598
 - essential, 566
 - pole, 566
 - removable, 566
- singularity expansion method, 472, 485
- singularity extraction, 462, 481, 503, 518, 523
- sinusoidal steady-state field, 238
- skin depth, 280
- slice gap model, 464, 481

- small-signal assumption, 235
- Snell's law, 286, 289, 290, 296, 301, 304
- solenoidal field, 362, 363
- solenoidal–lamellar decomposition, 362
- Sommerfeld radiation conditions, 252, 254, 383, 419, 420
- Sommerfeld, Arnold Johannes Wilhelm, 19, 22, 58, 383
- source
 - equivalent, 243
 - Huygens, 430
 - impressed, 90, 205, 257, 315, 339, 357, 367, 372, 415
 - nonradiating, 103
 - secondary, 90, 257, 429
 - symmetric, 357
- source-excluding region, 384, 430
- space harmonics, 346
- space-shifting theorem, 561
- spatial averaging, 7
- spatial frequency, 329, 559
 - spectrum, 329
- spatially dispersive medium, 27
- special relativity, 19, 34, 119
- specular reflection, 408
- sphere
 - cavity resonator, 621
 - conducting
 - scattering from, 406
 - dielectric
 - immersed in electrostatic field, 155
 - electrostatic force on, 141
 - mean value of potential, 182
 - multipole expansion of, 148
 - permanently magnetized, 178
 - Poincaré, 278
 - potential of, 149
 - potential of permanently polarized, 150
 - solution to Laplace's equation for, 620
 - solution to Poisson's equation for, 139
 - split, 620
- spherical Bessel functions, 618
- spherical coordinate system, 635
- spherical harmonics, 147, 600, 649
 - addition formulas, 651
 - applied to a permanently magnetized sphere, 179
 - applied to potential of a sphere, 149
 - functional relationships, 650
 - notation, 649
 - orthogonality relationships, 650
 - series expansion of a function, 651
 - series of, 651
- spherical shell
 - shielding by, 181
- spherical wave, 103, 384, 420, 429, 435
 - nonuniform, 325
 - phase velocity, 327
 - power carried by, 327
 - uniform, 325
 - wavelength, 327
- spin, 233
- spurious solutions, 92
- square material cylinder, 548
- square-root edge singularity, 324
- staircase approximation, 446
- staircasing effect, 543
- standing wave ratio, 448
- state, 4
- state variable, 4
- static field limit, 115
- stationary medium, 27
- steady current, 119
- Stokes parameters, 277
- Stokes's theorem, 624
- Stokes, George Gabriel, 63, 277
- stopband, 304, 307, 348
- Storer, James E., 480
- strain, mechanical, 77
- Stratton, Julius Adams, 415
- Stratton–Chu formulation, 415
 - for bounded space, 428
 - for unbounded space, 421
- streamlines, 174
- stress
 - electromagnetic, 81
 - mechanical, 77
- stress tensor
 - Maxwell's, 81, 97
 - mechanical, 78
- strip
 - conducting, 502
 - Hallén's integral equation for, 509
 - scattering width, 506, 510
 - TM integral equation for, 503
 - resistive, 511
 - scattering width, 514
 - TM integral equation for, 513
- Sturm–Liouville equation, 593
- Sturm–Liouville problem, 594

- higher-dimensional, 599
- regular, 594
- subdomain function, 443
- successive substitution, 441
- superposition, 69, 261, 329, 371
 - integral, 373
 - of plane waves, 334, 336, 340
- supplemental fields, 58
- surface charge density, 10
- surface current density, 11
- surface dipole moment density, 151
- surface impedance, 351
- surface resistance, 514
- surface traction, 78, 97
- susceptibility, 34
 - dielectric, 221
 - electric, 30, 48
 - magnetic, 30
- symmetric kernel, 440
- symmetry
 - electrostatic Green's function, 128
 - even, 359
 - odd, 359
 - of the moment method matrix, 462, 503, 518
 - periodic, 345
 - planar, 357
 - reflection, 358
 - spatial, 357
- system
 - cascaded, 347
 - closed, 80
 - electromagnetic, 77
 - mechanical, 77
 - reciprocal, 254
 - state of, 4
 - thermodynamic, 77
- Tai, Chen-To, 19, 44, 64
- TE polarization, 261
- TE wave, 285
- TE wave impedance, 309, 391
- TE–TM decomposition, 387
 - in spherical coordinates, 400
 - in terms of Hertzian potentials, 388
 - of a plane wave, 404
- telegrapher's equations, 445
- Tellegen medium, 33
- TEM fields
 - in terms of Hertzian potentials, 389
- TEM wave, 94, 264
- temporal frequency, 559
- temporally dispersive medium, 27
- tensor theory, 587
- terminology for the electromagnetic field, 22
- tesseral harmonics, 600
- Thales of Miletus, 5
- thin-wire approximation, 463, 477, 495
- thin-wire kernel, 463
- Thomson's theorem, 143, 183
- three-dimensional Green's function, 375
 - time-domain, 374
- tilde (\tilde{a}), 1
- tilt angle, 276
- time-average Poynting vector, 245
- time-domain reflection coefficient, 293
- time-harmonic field, 238, 239
- time-limited function, 561
- time-shifting theorem, 561
- TM polarization, 261
- TM wave, 286
- TM wave admittance, 391
- TM wave impedance, 309
- torque, 172, 234
 - on a planar loop, 173
- total derivative, 584
- total internal reflection, 293
- transform(s)
 - Fourier, 559
 - Hilbert, 204
- transient plane wave, 303
- transit time, 494
- transmission angle, 289, 304
- transmission coefficient, 288, 298, 340
- transmission line
 - analyzed using integral equations, 445
 - biconical, 327
 - standing wave ratio, 448
- transmission parameters, 347
- transparency range, 208
- transport theorems, 582
 - Helmholtz theorem, 586
 - Reynolds theorem, 587
- transverse electric, 388
- transverse electric wave, 285
- transverse electromagnetic, 389
- transverse electromagnetic wave, 94, 264
- transverse field, 386, 387
- transverse gradient, 261

- transverse Laplacian, 260, 329, 331, 385
- transverse magnetic, 388
- transverse magnetic wave, 286
- transverse position vector, 260
- transverse vector component, 384
- transverse-longitudinal decomposition, 386
 - identities, 627
- traveling wave, 274, 308, 331, 499
- triangular pulse function, 563
 - Fourier transform, 629
- two-dimensional field relations, 261
- two-dimensional fields, 312, 331
- two-dimensional Fourier transform, 330
- two-dimensional Green's function, 313, 500
 - electrostatic potential, 131
 - spectral representation, 337
- two-dimensional Helmholtz equation, 260

- uncharged conductor, 117
- uniform cylindrical wave, 100
- uniform plane wave, 93, 263, 289, 330
- uniform spherical wave, 325
- uniqueness, 24, 25, 44, 125, 169, 249, 286, 342, 373, 375, 432
 - electrostatic field, 125
 - magnetostatic field, 166
 - of eigenfunctions, 595
 - Poisson's equation, 127
 - time-harmonic fields, 251
 - vector potential, 159
- unit dyadic, 591
- unit step function, 563
 - Fourier transform, 629
- units of the electromagnetic fields, 21

- vector algebra
 - cylindrical coordinates, 633
 - rectangular coordinates, 631
 - spherical coordinates, 636
- vector Green's theorem, 415
- vector Helmholtz equation, 259
- vector Huygens principle, 415, 429
 - Franz formula, 430
- vector identities, 623
- vector Kirchhoff solution, 415
- velocity of energy transport, 281
- vertical linear polarization, 278
- Volterra integral equation, 440

- water
 - Cole-Cole plot, 231
 - Debye spectrum of, 230
 - dispersion diagram, 271
 - transient reflection from, 295
- wave admittance
 - TM, 391
- wave equation
 - and uniqueness, 92
 - bianisotropic media, 90
 - conducting media, 91
 - for a waveguide, 391
 - for cylindrical wave, 101
 - nonuniform, 314
 - for electric Hertzian potential, 367
 - for electric scalar potential, 366, 371
 - for electric vector potential, 365, 371
 - for magnetic Hertzian potential, 369
 - for magnetic scalar potential, 369, 371
 - for magnetic vector potential, 369, 371
 - for plane wave, 94
 - for spherical wave, 104, 326
 - Fourier transform solution, 333
 - polar coordinates, 335
 - frequency-domain, 259
 - isotropic media, 90
 - one-dimensional
 - Fourier transform solution, 569
 - Fourier transform solution for dissipative media, 575
 - scalar, 92
 - using equivalent sources, 91
- wave impedance
 - for a cylindrical wave, 309
 - for a layered medium, 297
 - for a planar interface, 291, 292
 - for a spherical wave, 326
 - TE, 309, 391
 - TM, 309
- wave vector, 262, 334
 - reflected, 286
 - transmitted, 286
- wave(s)
 - backward, 98, 269, 346
 - completely polarized, 275
 - converging spherical, 104
 - creeping, 409
 - cylindrical
 - nonuniform, 319, 320
 - uniform, 308, 312

- electromagnetic, 88
 - evanescent, 272, 293, 335, 336, 390, 396
 - nonuniform plane, 282, 334
 - partially polarized, 275
 - plane, 262
 - polarization of, 94, 275
 - propagating, 95
 - randomly polarized, 275
 - spherical, 420, 429, 435
 - nonuniform, 325
 - uniform, 325
 - standing, 292, 316, 456, 603
 - TE, 285
 - TEM, 94, 264
 - TM, 286
 - transient cylindrical, 100
 - transient plane, 95, 293
 - transient spherical, 104
 - transverse electromagnetic, 264
 - traveling, 274, 292, 308, 316, 331, 603
 - uniform cylindrical, 100
 - uniform plane, 263, 330
 - uniform spherical, 103
 - velocity, 95
- wavefronts, 274, 310, 326
- waveguide, 269, 390, 514
 - boundary conditions, 392
 - cutoff condition, 393
 - cutoff frequency, 392
 - cutoff wavenumber, 516
 - dispersion diagram, 393
 - energy velocity, 397
 - integral equation for
 - TE modes, 521
 - TM modes, 517
 - mode orthogonality, 394
 - modes, 391
 - phase and group velocities, 393
 - power transport, 395
 - rectangular, 398
 - TE fields, 391
 - TM fields, 391
 - wave equation for, 391
- wavelength, 275, 327
 - in a waveguide, 394
- wavenumber, 196, 259, 263, 579
 - cutoff, 391
 - frequency symmetry, 265
 - Laplace domain, 487
- wedge
 - scattering from, 320
- weighting function, 443
- well-conditioned matrix, 448
- well-posed model, 24, 592
- Wiener–Hopf technique, 343
- Wilson, H.A., 43
- wire
 - force on, 170
 - integral equation for, 461
 - curved, 474
 - Hallén form, 477
 - Pocklington form, 477
 - thin-wire approximation, 463, 477
 - time-domain, 495
 - natural frequency, 487
 - Poynting flux in, 174
 - scattering from, 469
- work, 80, 121, 131, 143, 174
- work function, 118
- Wronskian, 311, 319, 322, 644
- zonal harmonics, 600