

# Index

- acceleration
  - comoving, 248
  - gravitational, 40
  - inertial, 248
  - standard, 41
- adiabatic
  - process, 72
- adiabatic deformation, 213
- advection spin-up, 456
- anelastic
  - elastic, 174
- aerodynamic
  - drag, 541
  - forces, 541
  - lift, 541
- aerodynamic efficiency, 556
- aerodynamics, 537
- aircraft
  - ailerons, 538
  - controls, 538
  - elevator, 538
  - pitch, 538
  - roll, 538
  - rudder, 538
  - yaw, 538
- aircraft takeoff, cruise, landing, 539
- airfoil, 547
  - thin, 566
- analytic drill, 93
- angle of attack, 543, 551
- angle of incidence, 543
- angular momentum, 306, 650
- anisotropy
  - elastic, 174
- antigravity, see centrifugal force, 111
- apple
  - Newton, 46
- Archimedes
  - principle, 78
- Archimedes' principle, 78
- Archimedes, of Syracuse, 77
- aspect ratio, 547, 552
- atm, 58
- atmosphere, 60
  - homentropic, 71
  - isothermal, 69
  - standard, 74
  - temperature lapse rate, 73
- average
  - pressure, 146, 176
- Avogadro's number, 5
- Avogadro, Lorenzo, 4
- axial vector, 30
- Bénard, Henri, 608
- balance
  - angular momentum, 306
  - energy, 578

- kinetic energy, 316
- laws, 10
- mass, 296
- momentum, 296, 557
- balance, laws of, 291
- banked turn, 545
- bar, 58
- barotropic fluid, 68
- basis vectors, 21
- bathtub vortex, 458
- bathtub whirl, 534
- bearing, 477
- Bernoulli's theorem, 264
- Bernoulli, Daniel, 58
- black hole, 51
- Blasius
  - boundary layer, 493
- Blasius, Paul Richard Heinrich, 493
- body, 10
  - floating, 83
  - submerged, 83
- body force, 11, 40
- Boeing 747, 539, 544
- bound vortex, 550
- boundary conditions
  - fluids, 336
- boundary layer, 483
  - acceleration, 487
  - Blasius', 493
  - deceleration, 487
  - downwash, 487
  - Ekman, 526
  - merging, 487
  - separation, 487, 488, 504
  - theory, 491
  - thickness, 468, 484, 490, 494
  - thickness estimate, 484
  - turbulence, 488
  - turbulent, 496
  - universal growth, 489
  - upflow, 487
  - varying slip-flow, 501
  - viscous growth, 485
- Boussinesq, Valentin Joseph, 597
- braking a car, 332
- Brownian motion, 5
- bubbles
  - sessile, 135
- bucket
  - rotating, 111
- bulk modulus, 69, 176
- buoyancy, 63, 78
  - center of, 82
- Burger's vortex, 454
- capillary
  - surface, 134
- capillary constant, 127
- capillary effect, 130
- capillary length, 125
- Cartesian
  - coordinate transformations, 24
- Cartesian coordinates, 19
- Cauchy, 277
  - equation of motion, 249
- Cauchy, Augustin, 141
- center of buoyancy, 82
- center of gravity, 82
- center of mass, 41, 238
  - Moon-Earth, 118
- center of roll, 85
- centrifugal
  - force, 111
  - potential, 111
- centrifugal force, 519
  - on Earth, 520
- CFD, 393
- channel entrance flow, 402
- circulating flow, 367
- circulation, 284, 549, 561
- Clapeyron, Benoit Paul Émile, 67
- clock, 16
- comoving
  - acceleration, 248
- comoving derivative, 246
- comoving volume, 239
- completeness, 22, 26
- compressibility, 69, 176
- compression
  - uniform, 179

- computational fluid dynamics, 393
- connected tubes, 292
- conservation
  - of mass, 244
- constant
  - gravity, 43
- constitutive equations, 148
- contact
  - surface, 57
- contact angle, 129
- contact force, 11
- continuity
  - equation, 245
  - precision, 6
- continuous matter, 3
- continuum, 13
  - approximation, 6, 238
  - dynamics, 248
  - hypothesis, 239
- continuum physics, 10
- contraction
  - uniform, 156
- control volume, 63
- coordinate
  - axes, 21
  - system, 17
  - transformations, 18, 24
- coordinate transformations, 18
- coordinates, 17
  - Cartesian, 19
  - curvilinear, 655
  - cylindrical, 655
  - spherical, 658
- Copernican principle, 252
- Copernicus, Nicolaus, 252
- Coriolis force, 517, 519
  - on Earth, 520
- cosmic ‘democracy’, 252
- cosmology
  - Newtonian, 252
- Couette flow, 369
- Couette, Maurice Frédéric Alfred, 369
- Coulomb, Charles, 143
- creeping flow, 379, 380
- cross product, 20
- curl, 29
- curling, 332
- current density of mass, 245
- curvilinear
  - basis vectors, 656
- curvilinear coordinates, 655
- cylinder symmetry, 367
- cylindrical
  - Laplacian, 657
- cylindrical coordinates, 655
- cylindrical vortex, 450
- d’Alembert’s paradox, 283, 560
- d’Alembert, Jean le Rond, 244
- Darcy, 359
  - friction factor, 361
- Darcy, Henri-Philibert-Gaspard, 362
- deformation, 6, 156
  - adiabatic, 213
  - energy, 180
  - isentropic, 213
  - local, 158
  - non-linear, 165
  - rate of, 335
  - uniform static, 178
- degrees of freedom, 661
- delta
  - Kronecker, 23
- density
  - angular momentum, 306
  - critical, 254
  - Earth, 39
  - mass, 38
- density of force, 40
- derivative
  - comoving, 246
  - material, 239, 246, 248
- derivatives, 21
- Descartes, René, 19
- descent
  - unpowered, 544
- differences
  - finite, 225
- differential equations, 11

- diffusion, 9, 333
- diffusive vortex spin-down, 451
- diffusivity, 333
- dilatation
  - uniform, 156
- direct product, 20
- discharge
  - mass, 245
- discharge rate, 352
- discretization
  - spatial, 397
  - temporal, 396
- displacement, 156, 238
  - field, 156
  - gradient, 159
  - linear, 157
- dissipation
  - Couette flow, 370
  - Poiseuille flow, 360
- distance, 19
  - invariance of, 19
- divergence, 29, 95
- dot product, 20
- drag, 332, 541, 557
  - coefficient, 386
  - crisis, 387
  - flat wing, 474
  - form, 554
  - induced, 555
  - pipe, 359
- drag estimates, 552
- drain flow, 318, 365
  - laminar, 365
  - turbulent, 366
- draught of ship, 84
- droplets
  - hanging, 136
  - sessile, 135
- dry fluid, 259
- dust cloud, 250
- dyadic product, 20
- dynamic
  - friction, 142
- dynamic pressure, 265
- dynamics, 248, 648
- Earth
  - gravity
    - plot, 45
  - mass density of, 39
  - potential, 47
  - spherical, 48
  - surface gravity, 41
  - tides, 113
- Earth's density, 39
- effective
  - incompressibility, 240
- effective force, 64
- effective incompressibility, 269
- effective mass, 284
- effective viscosity, 361
- Ekman layer, 526
  - suction, 529
  - upwelling, 529
  - valve, 532
- Ekman number, 523
- Ekman spiral, 528
- Ekman, Vagn Walfrid, 523
- elastic
  - energy, 180
  - energy density, 181
  - materials, 155
- elastic fluid, 270
- elastic tube, 198
- elasticity, 171
- elastostatic
  - uniqueness, 183
- elastostatics, 187
  - numeric, 223
- energy
  - elastic, 180
  - external field, 104
  - gravitational, 106
  - internal, 661
  - of deformation, 180
  - potential, 49
- energy balance, 578
- energy density, 106
- engine thrust, 539
- entrance length, 402
- entropy, 72

- equation of continuity, 245
- equation of state, 67
- equations of motion
  - creeping flow, 380
- equilibrium
  - mechanical, 148
  - global, 63
  - homotropic, 68
  - hydrostatic, 63, 96
  - isothermal, 68
  - local, 148
    - hydrostatic, 65
  - mechanical, 63
  - Navier's equation, 188
- equipartition theorem, 661
- equipotential
  - surface, 47, 110
- equivalence principle, 40, 521
- escape velocity, 50
- Euclidean geometry, 19
- Euler
  - equation, 260
- Euler, Leonhard, 260
- Eulerian
  - displacement, 166
- exactly solvable flows, 349
- explosion, 250
- extensive quantity, 291
- external forces, 652
- external stress, 143
- extreme flying, 540
  
- föhn, 74
- falling sphere, 383
- falling sphere viscometer, 384
- fictitious
  - forces, 111
- fictitious forces, 518
- field
  - equations, 249
  - displacement, 156
  - energy, 104
  - equations, 11
  - lines, 41, 277
  - pressure, 59
  - velocity, 238
  - vorticity, 276
- field energy density, 106
- fields, 11, 29
  - mechanic, 11
  - physical reality, 12
  - thermodynamic, 11
- finite differences, 225
- flat Earth
  - approximation, 521
- flat wing, 474
- flight
  - subsonic, 537
- floating block, 88
- floating body, 83
- flow, 6, 238
  - stationary, 263
  - steady, 263
    - between plates, 351
  - circulating, 367
  - Couette, 369
  - creeping, 379, 380
  - geostrophic, 523
  - irrotational, 277, 278
  - isobaric, 524
  - laminar, 328
  - nearly ideal, 487
  - planar, 331
  - potential, 278
  - pressure driven, 351
  - rotating, 521
  - visualization, 242
- flow potential, 279
- fluid
  - elastic, 270
  - at rest, 57
  - barotropic, 68
  - dry, 259
  - ideal, 259, 260
  - incompressible, 241
  - interface, 110
  - isotropy, 334
  - macroscopic definition, 58
  - Newtonian, 327
  - particle, 9

- rotating, 111, 517
- fluid matter, 6
- flux
  - velocity, 239
  - gravity, 94
- flux of mass, 245
- force, 648
  - body, 11
  - centrifugal, 519
  - contact, 11
  - Coriolis, 519
  - effective, 64
  - fictitious, 518
  - moment, 40
  - shear, 141
  - total, 40
- forces
  - aerodynamic, 541
- form drag, 554
- Fourier, Jean Baptiste Joseph, 581
- friction, 142
  - dynamic, 142
  - factor, 385
  - pipe, 359
  - skin, 553
  - static, 142
  - viscous, 332
- friction coefficient, 495
- friction factor, 361
  - Darcy, 359
- Froude, William, 622
- galaxies, 250
- Galilei, Galileo, 40
- Galileo, 113
- gas
  - ideal, 67
- gas constant, 67
- Gauss
  - theorem, 95
- Gauss, Johann Karl Friedrich, 66
- geodesic, 19
- geometry
  - axially invariant, 133
  - Euclidean, 19
  - planar, 351
  - planar curves, 131
  - tubular, 355
- geostrophic flow, 523
  - two-dimensionality, 525
- glide angle, 544
- glide ratio, 544
- global
  - mass balance, 296
- global quantities, 10
- global quantity, 38
- Goldstein singularity, 504, 506
- gradient, 29
  - field, 46
  - forces, 67
- gradient descent, 225, 394
- Grashof, Franz, 598
- gravitational
  - flux, 94
  - work, 49
- gravitational constant, 43
- gravitational potential, 46
- gravity, 37, 40
  - additivity, 43
  - asymptotic, 44, 48
  - center of, 82
  - closed loops, 50
  - constant, 41, 48, 79
  - flux of, 94
  - Newton's law, 43
  - non-locality, 46
  - source of, 95
  - sources, 43
  - spherical, 44
- gravity-driven flow, 354
- Hagen, Gotthilf Heinrich Ludwig, 356
- Hagen-Poiseuille law, 357
- heat, 316
- heat capacity, 662
- heat equation, 68
- Helmholtz, Hermann von, 448
- hierarchies of interactions, 653
- homentropic

- atmosphere, 71
- star, 99
- homentropic equilibrium, 68
- homentropic state, 72
- Hooke's law, 172
  - inverted, 176
- Hooke, Robert, 171
- horseshoe vortex system, 550
- Hubble's
  - constant, 251
  - law, 251
- Hugoniot, Pierre Henri, 627
- hydrodynamic similarity, 340
- hydrostatic
  - equilibrium, 63, 65, 96
  - paradox, 60
  - pressure, 146
- hydrostatic equilibrium, 57
- hydrostatic shapes, 109
- hydrostatics, 63
- ice sports, 332
- iceberg, 109
- ideal fluid, 259, 260
- ideal gas, 661
- ideal gas law, 67
- improper quantities, 30
- improper vector, 31
- incompressibility, 69, 240
  - effective, 269
- incompressible flow, 350, 380, 394
- incompressible fluid, 241
- index notation, 23
- induced drag, 555
- inertia
  - term, 248
- inertial
  - forces, 111
- inertial acceleration, 248
- instability
  - Rayleigh-Taylor, 434
- intensive quantity, 291
- interface
  - fluid, 110
- internal energy, 661
- internal forces, 652
- internal stress, 143
- internal waves, 433
- interpolation
  - Rankine vortex, 451
- invariance of distance, 19
- irrotational flow, 277, 278
- isentropic
  - process, 72
- isentropic deformation, 213
- isobar, 110
- isobaric flow, 524
- isothermal
  - atmosphere, 69
- isothermal equilibrium, 68
- isotropic fluids, 334
- isotropy
  - elastic, 174
- Jesus number, 129
- Joukowski, Nikolai Yegorovich, 562
- Joule, James Prescott, 664
- journal bearing, 477
  - unloaded, 371
- Kármán, Theodore von, 498
- Kelvin's circulation theorem, 286, 448
- Kelvin, lord, 286
- Kepler, Johannes, 113
- kinematic viscosity, 330
  - table of, 330
- kinetic energy, 651
- Kronecker delta, 23
- Kronecker, Leopold, 23
- Kutta, Martin Wilhelm, 562
- Kutta-Joukowski theorem, 549, 562
- Lamé coefficients, 174
- Lamé, Gabriel, 174
- laminar flow, 328, 338, 356
- laminar wake, 568
- Lane-Emden solutions, 101
- Laplace
  - equation, 96
  - operator, 95

- Laplace, Pierre Simon, 95
- Laplacian
- cylindrical, 657
  - spherical, 659
- lapse rate
- atmospheric, 73
- law
- Young-Laplace, 128
- laws of balance, 10
- length, 18
- unit, 18
- Leonardo's law, 241
- Levi-Civita symbol, 24
- Levi-Civita, Tullio, 24
- lift, 332, 541, 547, 549, 557
- flat wing, 474
- lift coefficient, 550
- lift estimates, 546
- lift-to-drag ratio, 556
- Lilienthal, Otto, 540
- line vortex, 448
- linear
- displacement, 157
- local
- deformation, 165
- local angular velocity, 521
- local quantity, 38
- local rotation, 277
- longitudinal waves, 214
- lubricated bearing, 477
- lubrication, 467
- Münchhausen, von, 79
- Mach number, 269
- Mach's principle, 521
- Mach, Ernst, 270
- MacLaurin, Colin, 122
- macroscopic
- scale, 8
- Marangoni, Carlo, 609
- mass, 296
- center, 41, 238
  - current density of, 245
  - discharge, 245
  - effective, 284
  - flux, 245
  - total, 38
  - unit, 16
- mass balance, 296
- mass conservation, 244, 296
- global, 245
  - local, 245
- mass density, 38
- material
- particle, 9
  - properties, 11
- material derivative, 239, 246, 248
- material transport, 291
- mathematical pendulum, 132
- matrix
- trace, 147
- matrix notation, 145
- mean free path, 8
- mechanic fields, 11
- mechanical equilibrium, 148
- mechanical quantities, 10
- mechanics
- continuum, 10
  - Newtonian, 9
- merging boundary layers, 487
- meta-law of physics, 6
- metacenter, 87
- microscopic
- scale, 7
- microbiography
- Archimedes, of Syracuse, 77
  - Avogadro, Lorenzo, 4
  - Bénard, Henri, 608
  - Bernoulli, Daniel, 58
  - Blasius, Paul Richard Heinrich, 493
  - Boussinesq, Valentin Joseph, 597
  - Cauchy, Augustin, 141
  - Clapeyron, Benoit Paul Émile, 67
  - Couette, Maurice Frédéric Alfred, 369
  - Coulomb, Charles, 143
  - d'Alembert, Jean le Rond, 244



- Darcy, Henri-Philibert-Gaspard, 362
- Descartes, René, 19
- Ekman, Vagn Walfrid, 523
- Euler, Leonhard, 260
- Fourier, Jean Baptiste Joseph, 581
- Froude, William, 622
- Galilei, Galileo, 40
- Gauss, Johann Karl Friedrich, 66
- Grashof, Franz, 598
- Hagen, Gotthilf Heinrich Ludwig, 356
- Helmholtz, Hermann von, 448
- Hooke, Robert, 171
- Hugoniot, Pierre Henri, 627
- Joukowski, Nikolai Yegorovich, 562
- Joule, James Prescott, 664
- Kármán, Theodore von, 498
- Kelvin, lord, 286
- Kepler, Johannes, 113
- Kronecker, Leopold, 23
- Kutta, Martin Wilhelm, 562
- Lamé, Gabriel, 174
- Laplace, Pierre Simon, 95
- Levi-Civita, Tullio, 24
- Lilienthal, Otto, 540
- Münchhausen, von, 79
- Mach, Ernst, 270
- MacLaurin, Colin, 122
- Marangoni, Carlo, 609
- Millikan, Robert A. , 384
- Montgolfier, Joseph Michel, 80
- Navier, Claude Louis Marie Henri, 188
- Newton, Sir Isaac, 9
- Ostwald, Wilhelm, 358
- Péclet, Jean-Claude Eugene, 586
- Pascal, Blaise, 62
- Perrin, Jean-Baptiste, 5
- Pitot, Henri, 267
- Poiseuille, Jean-Louis-Marie, 356
- Poisson, Simeon Denis, 96
- Prandtl, Ludwig, 483
- Proudman, Joseph, 525
- Rankine, William John Macquorne, 450
- Rayleigh, lord, 217
- Reynolds, Osborne, 338
- Richardson, Lewis Fry, 596
- Rosby, Carl-Gustav Arild, 522
- Siple, Paul Allen, 591
- Stokes, George Gabriel, 285
- Taylor, Geoffrey Ingram, 525
- Torricelli, Evangelista, 266
- Venturi, Giovanni Batista, 269
- Vinci, Leonardo da, 241
- Waals, Johannes van der, 5
- Wright, Wilbur and Orville, 538
- Young, Thomas, 171
- micropolar materials, 151
- Millikan's experiment, 384
- Millikan, Robert A., 379
- Millikan, Robert A. , 384
- modulus  
     extension, 172  
     of rigidity, 175
- molar  
     gas constant, 67  
     mass, 4
- mole, 4
- molecular  
     forces, 5  
     motion, 6  
     separation, 5  
     weight, 4
- molecular estimate  
     surface tension, 126
- molecules, 4
- moment  
     restoring, 85
- moment of force, 40, 542, 650
- momentum, 296, 648  
     balance, 296
- momentum balance, 557

- momentum diffusion, 333
- Montgolfier, Joseph Michel, 80
- Moon
  - orbit, 116
- moving body, 380
- nabla, 29, 46
- Navier, 335, 343
- Navier's equation of motion, 212
- Navier's equilibrium equation, 188
- Navier, Claude Louis Marie Henri, 188
- Navier-Cauchy equation, 188
- Navier-Cauchy equations, 188
- Navier-Stokes equation, 335, 343
- Navier-Stokes equations
  - incompressible rotating fluid, 521
- nearly ideal flow, 487
- Newton
  - bucket, 111
  - third law, 44
- Newton's apple, 46
- Newton's bucket, 275
- Newton's second law, 9
- Newton, Sir Isaac, 9
- Newtonian
  - fluids, 327
- Newtonian cosmology, 252
- Newtonian mechanics, 9, 647
- no-slip boundary condition, 331, 337
- non-classical continuum theory, 151
- non-linearity, 12
- non-locality
  - of gravity, 46
- notation
  - matrix, 145
- numeric elastostatics, 223
- objectivity of physics, 16
- oil drop experiment, 379, 384
- Olympic games, 121
- open canal, 524
- orthogonal
  - matrix, 27
- orthogonality, 26
- Oseen-Lamb vortex, 451
- Ostwald viscometer, 358
- Ostwald, Wilhelm, 358
- Péclet, Jean-Claude Eugene, 586
- paradox
  - d'Alembert, 283
- paradox of hydrostatics, 60
- particle
  - material, 9
- particle orbits, 243
- Pascal
  - law, 62
- pascal
  - unit, 58
- Pascal's law, 62
- Pascal, Blaise, 62
- pendulum
  - mathematical, 132
- penetration length, 334
- period
  - diurnal, 117
  - semidiurnal, 117
- Perrin, Jean-Baptiste, 5
- phase velocity, 261, 334
- physics
  - continuum, 10
- pipe flow, 356
- pipe friction, 359
- pipe resistance, 359
- Pitot
  - tube, 267
- Pitot, Henri, 267
- planar flow, 331
- planar geometry, 351
- planet
  - constant density, 105
  - fast rotation, 122
  - model, 99
  - rotating, 118
  - two-layer, 682
- plants
  - sap rising, 128
- Poiseuille flow, 356

- Poiseuille, Jean-Louis-Marie, 356
- Poisson
  - equation, 95, 96
- Poisson's ratio, 173
- Poisson, Simeon Denis, 96
- polar vector, 30
- position, 17
- positivity
  - constraints, 177
  - elastic energy, 181
- potential
  - gravity, 46
- potential energy, 49
- potential flow, 278
  - cylinder, 279
  - sphere, 282
- power, 651
- Prandtl equations, 492
- Prandtl, Ludwig, 483
- precision
  - continuity, 6
- pressure, 58, 61
  - dynamic, 265
  - effective, 265
  - stagnation, 265
  - static, 265
  - average, 146, 176
  - effective, 350
  - field, 59
  - force, 57
  - hydrostatic, 146
  - non-locality, 337
  - potential, 65, 70
  - total, 61
- pressure driven flow, 352
- pressure head, 265
- pressure waves, 261
- principal roll axis, 89
- proper rotation, 27
- proper vector, 31
- proportionality limit, 178
- Proudman pillars, 525
- Proudman, Joseph, 525
- pseudo-quantities, 30
- pseudoscalar, 31
- quantities
  - global, 10
- quantity
  - extensive, 291
  - intensive, 291
- quasistatic
  - tidal cycles, 116
- quotient rule, 35
- Rankine vortex, 450
- Rankine, John Macquorne, 450
- Rankine, William John Macquorne, 450
- rate of deformation, 335
- Rayleigh waves, 217
- Rayleigh, lord, 217
- Rayleigh-Taylor instability, 434
- reference frame, 16
- reflection, 30
  - simple, 25
- relaxation, 224, 230
- Reynolds
  - number, 357
- Reynolds number, 338, 357, 361, 384, 454
  - local, 495
- Reynolds, Osborne, 338, 361
- Richardson, Lewis Fry, 596
- roll
  - center, 85
- roll axis, principal, 89
- Rossby
  - radius, 531
- Rossby number, 522
- Rossby, Carl-Gustav Arild, 522
- rotating
  - bucket, 111
  - planet, 118
- rotating flow, 521
- rotating fluid, 111, 517
- rotation, 27
  - general, 27
  - local, 277
  - simple, 25
- rowboat, 87

- scalar, 27
- sea
  - incompressible, 59
- second, 17
- secondary flow, 373, 453
- self-energy, 104
- self-potential, 120
- self-similarity, 490, 493
- semidiurnal
  - tides, 114
- shapes
  - axially invariant, 133
  - hydrostatic, 109
- shear
  - force, 57, 141
  - modulus, 175
  - slippage, 337
  - stress, 143
  - uniform, 180
  - viscosity, 328
- shear stress
  - wall, 485
- shear waves, 334
- ship stability, 84
- ship with liquid cargo, 88
- simple
  - rotation, 158
  - scaling, 158
  - translation, 157
- Siple, Paul Allen, 591
- skin drag
  - laminar, 496
  - turbulent, 498
- skin friction, 553
- slip velocity, 491
- smoothness
  - macroscopic, 8
- solid
  - particle, 9
- solid matter, 6
- sound, 211, 261
  - velocity, 269
  - equation, 212
  - speed, 262
- sources, 291
- space, 17
- space and time, 15
- spatial discretization, 397
- specific heat, 72
- speed of sound, 262
- spherical
  - body, 97
  - Laplacian, 659
- spherical coordinates, 658
- spherical mass distribution, 48
- spherical systems, 39
- spring constant, 172
- stability
  - atmospheric, 74
  - criterion, 374
  - rotating body, 112
  - ships, 84
- stagnation point, 265
- stagnation pressure, 265
- stall, 555
- stall angle, 551
- standard acceleration, 41
- star
  - homentropic, 99
- static
  - uniform deformation, 178
- static friction, 142
- static head, 265
- static pressure, 265
- stationary flow, 263
- steady
  - descent, 544
  - flight, 542
  - rotation, 518
  - vortex, 530
- steady climb, 543
- steady flow, 263, 350
- Stokes, 335, 343
  - stress tensor, 342
- Stokes' field, 381
- Stokes' flow, 380
- Stokes' law, 383
- Stokes' problem, 489
- Stokes' radius, 388
- Stokes' theorem, 285

- Stokes, George Gabriel, 285
- strain, 155, 158
  - rate of, 335
  - tensor, 160
  - work, 164
- strain tensor
  - symmetry, 163
- streaklines, 243
- streamlines, 242
- stress, 141
  - Cauchy's hypothesis, 147
  - internal, 143
  - vector, 143, 147
- stress tensor, 145
  - symmetry, 149
- stretching
  - uniform, 179
- submerged body, 83
- subsonic flight, 537
- superposition, 188
- surface
  - element, 61
  - equipotential, 110
  - oriented, 61
- surface tension, 109, 125
  - definition, 126
- surfactant, 129
- sustained vortex, 453
- symmetry, 655
  - stress tensor, 149
- table of
  - kinematic viscosities, 330
  - shear viscosities, 328
- Taylor columns, 525
- Taylor vortices, 373, 375
- Taylor, Geoffrey Ingram, 525
- Taylor-Proudman theorem, 525
- tea cup flow, 374
- temperature lapse rate
  - star, 99
- temporal discretization, 396
- tensile strength, 144
- tensor, 28
  - notation, 23
  - product, 20
  - rank, 28
  - strain, 160
  - stress, 145
  - transformation, 28
- tensor field, 145
- terminal speed, 388
- thermodynamic fields, 11
- thermodynamics, 67, 316
- thickness
  - boundary layer, 494
- thin airfoil, 566
- Thomson, William, 286
- tidal
  - range, 116
- tides
  - cycles, 116
- tides of Earth, 113
- time, 16
  - unit, 17
- tornado, 447
- torque, 197
  - Couette flow, 370
- Torricelli's law, 266
- Torricelli, Evangelista, 266
- torsion, 196
- torsional rigidity, 197
- total head, 265
- total mass, 38
- trace
  - matrix, 147
- trailing wake, 557
- transformation
  - general, 25
  - matrix, 26
- translation
  - simple, 25
  - vector, 26
- transport
  - material, 291
- transposition
  - matrix, 27
- transverse waves, 214, 334
- triplet, 17
- troposphere, 71

- tube
  - elastic, 198
- tubular flow, 355
- turbulence, 12
  - pipe flow, 361
- two-dimensional airfoils, 563
- two-layer planet, 682
- uniform
  - contraction, 156
  - dilatation, 156
  - static deformation, 178
  - stretching, 179
- uniform compression, 179
- uniform shear, 180
- uniqueness
  - elastostatics, 179
- unit
  - atm, 58
  - bar, 58
  - length, 18
  - mass, 16
  - pascal, 58
  - time, 17
- unit of mass, 16
- vector, 28
  - algebra, 20
  - axial, 30
  - derivatives, 21
  - improper, 31
  - norm, 21
  - polar, 30
  - product, 20, 24
  - proper, 31
  - space, 20
  - square, 21
- vector basis, 21
- velocity field, 238
- velocity head, 265
- velocity of sound, 269
- velocity potential, 279
- Venturi, Giovanni Batista, 269
- vibrations
  - in solids, 211
- Vinci, Leonardo da, 241
- virial theorem, 427
- viscometer
  - Ostwald, 358
- viscosity, 327
  - molecular origin, 328
  - Newtonian, 328
  - shear, 328
- viscous friction, 332
- viscous sublayer, 500
- volume
  - control, 63
- volume force, 40
- volume product, 21
- volumetric discharge, 357
- vortex, 447
  - bathtub, 458
  - core, 450
  - filament, 448
  - lines, 448
  - Oseen-Lamb, 451
  - Rankine, 450
  - sheet, 563
  - spin-up, 456
  - spindle-driven, 372
  - steady, 530
  - strength, 448
  - sustained, 453
  - tubes, 448
- vortex lines, 277
- vortex tube, 278
- vorticity, 275, 560
  - equation of motion, 278
  - field, 276
  - generation, 490
- vorticity field, 276
- Waals, Johannes van der, 5
- wall shear stress, 485
- wall stress, 495
- waterberg, 109, 110
- wave
  - monochromatic, 215
  - plane, 216
  - radial, 219

- shear, 334
  - transverse, 334
- wave equation, 261
- waves, 214
  - pressure, 261
  - free, 213
  - internal, 433
- weather maps, 524
- weight, 40
- weigh, 78
- whirl, 447
- wing
  - chord, 547
  - flat, 474
  - span, 547
  - thickness, 547
- Wright, Wilbur and Orville, 538
  
- yield stress, 144
- Young's modulus, 172
- Young, Thomas, 171
- Young-Laplace law, 128

