

A

Absolute differentiation 120
 Absolute scalar field 43
 Absolute tensor 45,46,47,48
 Acceleration 121, 190, 192
 Action integral 198
 Addition of systems 6, 51
 Addition of tensors 6, 51
 Adherence boundary condition 294
 Aelotropic material 245
 Affine transformation 86, 107
 Airy stress function 264
 Almansi strain tensor 229
 Alternating tensor 6,7
 Ampere's law 176,301,337,341
 Angle between vectors 80, 82
 Angular momentum 218, 287
 Angular velocity 86,87,201,203
 Arc length 60, 67, 133
 Associated tensors 79
 Auxiliary Magnetic field 338
 Axis of symmetry 247

B

Basic equations elasticity 236, 253, 270
 Basic equations for a continuum 236
 Basic equations of fluids 281, 287
 Basis vectors 1,2,37,48
 Beltrami 262
 Bernoulli's Theorem 292
 Biharmonic equation 186, 265
 Bilinear form 97
 Binormal vector 130
 Biot-Savart law 336
 Bipolar coordinates 73
 Boltzmann equation 302,306
 Boundary conditions 257, 294
 Bulk modulus 251
 Bulk coefficient of viscosity 285

C

Cartesian coordinates 19,20,42, 67, 83
 Cartesian tensors 84, 87, 226

Cauchy stress law 216
 Cauchy-Riemann equations 293,321
 Charge density 323
 Christoffel symbols 108,110,111
 Circulation 293
 Codazzi equations 139
 Coefficient of viscosity 285
 Cofactors 25, 26, 32
 Compatibility equations 259, 260, 262
 Completely skew symmetric system 31
 Compound pendulum 195,209
 Compressible material 231
 Conic sections 151
 Conical coordinates 74
 Conjugate dyad 49
 Conjugate metric tensor 36, 77
 Conservation of angular momentum 218, 295
 Conservation of energy 295
 Conservation of linear momentum 217, 295
 Conservation of mass 233, 295
 Conservative system 191, 298
 Conservative electric field 323
 Constitutive equations 242, 251,281, 287
 Continuity equation 106,234, 287, 335
 Contraction 6, 52
 Contravariant components 36, 44
 Contravariant tensor 45
 Coordinate curves 37, 67
 Coordinate surfaces 37, 67
 Coordinate transformations 37
 Coulomb law 322
 Covariant components 36, 47
 Covariant differentiation 113,114,117
 Covariant tensor 46
 Cross product 11
 Curl 21, 173
 Curvature 130, 131, 134, 149
 Curvature tensor 134, 145
 Curvilinear coordinates 66, 81
 Cylindrical coordinates 18, 42, 69

D

Deformation 222
 Derivative of tensor 108
 Derivatives and indicial notation 18, 31
 Determinant 10, 25, 32, 33
 Dielectric tensor 333
 Differential geometry 129
 Diffusion equation 303
 Dilatation 232
 Direction cosines 85
 Displacement vector 333
 Dissipation function 297
 Distribution function 302
 Divergence 21, 172
 Divergence theorem 24
 Dot product 5
 Double dot product 50, 62
 Dual tensor 100
 Dummy index 4, 5
 Dyads 48, 62, 63
 Dynamics 187

E

e Permutation symbol 6, 7, 12
 ϵ - δ identity 12
 Eigenvalues 179, 189
 Eigenvectors 179, 186
 Einstein tensor 156
 Elastic constants 248
 Elastic stiffness 242
 Elasticity 211, 213
 Electrostatic field 322, 333
 Electric flux 327
 Electric units 322
 Electrodynamics 339
 Electromagnetic energy 341
 Electromagnetic stress 341, 342
 Elliptic coordinates 72
 Elliptical cylindrical coordinates 71
 Enthalpy 298
 Entropy 300
 Epsilon permutation symbol 83
 Equation of state 300

Equilibrium equations 273, 300
 Elastic constants 243, 248
 Equipotential curves 325
 Euler number 294
 Euler-Lagrange equations 192
 Eulerian angles 201, 209
 Eulerian form 287
 Eulerian system 227
 Eulers equations of motion 204

F

Faraday's law 176, 301, 340
 Field lines 324, 327
 Field electric 322
 First fundamental form 133, 143
 Fourier law 297, 299
 Free indices 3
 Frenet-Serret formulas 131, 188
 Froude number 294
 Fluids 281

G

Gas law 300
 Gauss divergence theorem 24, 330
 Gauss equations 138
 Gauss's law for electricity 176, 301, 328
 Gauss's law for magnetism 176, 301, 341
 Gaussian curvature 137, 139, 149
 Geodesics 140, 146
 Geodesic curvature 135, 140
 General tensor 48
 Generalized $\epsilon - \delta$ identity 84, 104
 Generalized Hooke's law 242
 Generalized Kronecker delta 13, 31
 Generalized stress strain 242
 Geometry in Riemannian Space 80
 Gradient 20, 171
 Gradient basis 37
 Green's theorem 24
 Group properties 41, 54
 Generalized velocity 121
 Generalized acceleration 121

H

Hamiltonian 208
 Heat equation 316
 Hexagonal material 247
 Higher order tensors 47, 93
 Hooke's law 212, 242, 252
 Hydrodynamic equations 283

I

Ideal fluid 283
 Idemfactor 50
 Incompressible material 231
 Index notation 1, 2, 14
 Indicical notation 1, 2, 14, 24
 Inner product 52
 Inertia 30
 Integral theorems 24
 Intrinsic derivative 120
 Invariant 43
 Inviscid fluid 283
 Isotropic material 248
 Isotropic tensor 104

J

Jacobian 17, 30, 40, 101, 127
 Jump discontinuity 330

K

Kronecker delta 3, 8, 13, 31, 76
 Kinetic energy 201
 Kinematic viscosity 302

L

Lagrange's equation of motion 191, 196
 Lagrangian 209
 Laplacian 174
 Linear form 96
 Linear momentum 209, 287
 Linear transformation 86
 Linear viscous fluids 284
 Lorentz transformation 57
 Lamé's constants 251

M

Magnitude of vector 80
 Magnetostatics 334, 338
 Magnetic field 334
 Magnetization vector 337
 Magnetic permeability 337
 Material derivative 234, 288
 Material symmetry 244, 246
 Maxwell equations 176, 339
 Maxwell transfer equation 308
 Maximum, minimum curvature 130, 140
 Mean curvature 137, 148
 Metric tensor 36, 65
 Meusnier's Theorem 150
 Mixed tensor 49
 Mohr's circle 185
 Moment of inertia 30, 184, 200
 Momentum 217, 218
 Multilinear forms 96, 98
 Multiplication of tensors 6, 51

N

Navier's equations 254, 257
 Navier-Stokes equations 288, 290
 Newtonian fluids 286
 Nonviscous fluid 283
 Normal curvature 135, 136
 Normal plane 188
 Normal stress 214
 Normal vector 130, 132
 Notation for physical components 92

O

Oblate Spheroidal coordinates 75
 Oblique coordinates 60
 Oblique cylindrical coordinates 102
 Order 2
 Orthogonal coordinates 78, 86
 Orthotropic material 246
 Outer product 6, 51
 Osculating plane 188

P

Parallel vector field 122
 Pappovich-Neuber solution 263
 Parabolic coordinates 70
 Parabolic cylindrical coordinates 69
 Particle motion 190
 Pendulum system 197, 210
 Perfect gas 283, 299
 Permutations 6
 Phase space 302
 Physical components 88, 91, 93
 Piezoelectric 300
 Pitch, roll, Yaw 209
 Plane Couette flow 315
 Plane Poiseuille flow 316
 Plane strain 263
 Plane stress 264
 Poisson's equation 329
 Poisson's ratio 212
 Polar element 273
 Polarization vector 333
 Polyads 48
 Potential energy 191
 Potential function 323
 Poynting's vector 341
 Pressure 283
 Principal axes 183
 Projection 35
 Prolated Spheroidal coordinates 74
 Pully system 194, 207

Q

Quotient law 53

R

Radius of curvature 130, 136
 Range convention 2, 3
 Rate of deformation 281, 286
 Rate of strain 281

Rayleigh impulsive flow 317
 Reciprocal basis 35, 38
 Relative scalar 127
 Relative tensor 50, 121
 Relative motion 202
 Relativity 151
 Relative motion 155
 Reynolds number 294
 Ricci's theorem 119
 Riemann Christoffel tensor 116, 129, 139, 147
 Riemann space 80
 Rectifying plane 188
 Rigid body rotation 199
 Rotation of axes 85, 87, 107
 Rules for indices 2

S

Scalar 40, 43
 Scalar invariant 43, 62, 105
 Scalar potential 191
 Scaled variables 293
 Second fundamental form 135, 145
 Second order tensor 47
 Shearing stresses 214
 Simple pulley system 193
 Simple pendulum 194
 Skew symmetric system 3, 31
 Skewed coordinates 60, 102
 Solid angle 328
 Space curves 130
 Special tensors 65
 Spherical coordinates 18, 43, 56, 69, 103, 194
 Stokes flow 318
 Stokes hypothesis 285
 Stokes theorem 24
 Straight line 60
 Strain 218, 225, 228
 Strain deviator 279

Stress 214
 Stress deviator 279
 Strong conservative form 298
 Strouhal number 294
 St Venant 258
 Subscripts 2
 Subtraction of tensors 51, 62
 Summation convention 4, 9
 Superscripts 2
 Surface 62, 131
 Surface area 59
 Surface curvature 149
 Surface metric 125, 133
 Susceptibility tensor 333
 Sutherland formula 285
 Symmetric system 3, 31, 51, 101
 Symmetry 243
 System 2, 31

T

Tangential basis 37
 Tangent vector 130
 Tensor and vector forms 40, 150
 Tensor derivative 141
 Tensor general 48
 Tensor notation 92, 160
 Tensor operations 6, 51, 175
 Test charge 322
 Thermodynamics 299
 Third fundamental form 146
 Third order systems 31
 Toroidal coordinates 75, 103
 Torus 124
 Transformation equations 17, 37, 86
 Transitive property 45, 46
 Translation of coordinates 84
 Transport equation 302
 Transposition 6
 Triad 50
 Trilinear form 98
 Triple scalar product 15

U

Unit binormal 131, 192
 Unit normal 131, 191
 Unit tangent 131, 191
 Unit vector 81, 105

V

Vector identities 15, 20, 315
 Vector transformation 45, 47
 Vector operators 20, 175
 Vector potential 188
 Velocity 95, 121, 190, 193
 Velocity strain tensor 281
 Viscosity 285
 Viscosity table 285
 Viscous fluid 283
 Viscous forces 288
 Viscous stress tensor 285
 Vorticity 107, 292

W

Wave equation 255, 269
 Weighted tensor 48, 127
 Weingarten's equation 138, 153
 Work 191, 279
 Work done 324

Y

Young's modulus 212