

Index

A

absolute extremum, 103
 acceleration
 normal component, 359
 tangential component, 359
 acceleration vector, 359
 algebraic precedence, 523
 alternating harmonic series, 285
 anti-parallel vectors, 322
 antiderivative, 139
 arc length, 244, 353
 arc length parameterization, 354
 arccosine, 197
 arcsine, 196
 area
 between curves, 155
 under a curve, 435
 under curve, 135
 asymptote, 23, 100
 average, 419
 average height, 399

B

bell curve, 238
 binormal, 358, 451
 bounded function, 53

C

cardioid, 254
 Cartesian coordinates, 253, 337

Cauchy Principal Value, 232

center of mass, 419
 centroid, 228, 416
 chain rule, 67
 characteristic polynomial, 484
 chord, 32
 circle
 area, 523
 circumference, 523
 equation of, 21, 524
 unit, 21
 Clairaut's Theorem, 387
 closed paths, 441
 completing the square, 523
 composition of functions, 27, 45, 67
 concave down, 98
 concave up, 98
 cone
 lateral area, 524
 surface area, 524
 volume, 524
 conservative vector field, 440
 continuous, 55, 369
 convergent sequence, 271
 convergent series, 276
 coordinates
 Cartesian, 253, 337
 converting rectangular to polar, 254
 cylindrical, 337
 polar, 253, 337
 rectangular, 253, 337
 spherical, 339

D

definite integral, 143
 $\det(\nabla)$, 381
 dependent variable, 24
 derivative, 34, 48
 dot notation, 116
 Leibniz notation, 49
 second, 97, 98
 difference quotient, 32
 differentiable, 55, 376
 differential, 128
 differential equation, 469
 first order, 470
 particular solution, 472
 separable, 472
 direction vector, 333
 directional derivative, 382
 discrete probability, 235
 discriminant, 388
 displacement vector, 315
 divergence test, 278
 Divergence Theorem, 464
 divergent sequence, 271
 divergent series, 276
 domain, 23
 dot notation, 116
 dot product, 321
 double integral, 400

E

ellipse
 area, 523
 equation of, 524

ellipsoid, 251
 error estimate, 219
 escape velocity, 234
 Euler's Method, 480
 expected value, 236
 exponential distribution, 239
 Extreme Value Theorem, 105

F

Fermat's Theorem, 92
 flux, 457
 frustum, 247
 Fubini's Theorem, 403
 function, 22
 bounded, 53
 differentiable, 55
 implicit, 82
 linear, 22
 of two variables, 370
 rational, 214
 unbounded, 54
 function composition, 27
 Fundamental Theorem of Algebra, 95
 Fundamental Theorem of Calculus, 137

G

Gabriel's horn, 235, 250
 geometric series, 276
 global extremum, 103
 gradient, 381
 greatest integer, 95

H

harmonic series, 279
 alternating, 285
 Hooke's Law, 175
 hyperbolic cosine, 199
 hyperbolic sine, 199
 hypercycle, 264
 hypocycloid, 264

I

implicit differentiation, 82, 379
 implicit function, 82
 improper integral, 231
 convergent, 231
 diverges, 231
 incompressible, 450
 indefinite integral, 143

independent variable, 24
 inflection point, 99

initial condition, 470
 initial value problem
 first order, 470

integral

 improper, 231

 indefinite, 143

 of sec x , 209

 of $\sec^3 x$, 209

 properties of, 147

integral sign, 139

integral test, 282

integration

 by parts, 210

Intermediate Value Theorem, 55

interval of convergence, 296

inverse sine, 196

involute, 264

J

Jacobian, 430
 judicious guessing, 487

K

kinetic energy, 233

L

L'Hôpital's Rule, 88

Lagrange multipliers, 393

lateral area of a cone, 114

law of cosines, 321, 524

law of sines, 524

Leibniz notation, 49

level curve, 365

level set, 366

level surface, 366

limit, 41

limit at infinity, 87

limit of a sequence, 271

line integral, 435

linear approximation, 127

linearity of the derivative, 60

local extremum, 91

local maximum, 91

local minimum, 91

logistic equation, 474

long division of polynomials, 216

M

Maclaurin series, 300
 mass, 419
 mean, 236, 239
 Mean Value Theorem, 130
 moment, 227, 414, 420

N

Napier's constant, 188
 Newton, 174
 Newton's law of cooling, 469
 Newton's method, 123–125
 normal, 330, 358
 normal distribution, 244

O

one sided limit, 46
 optimization, 103
 orientable surface, 458
 oriented curve, 443

P

p -series, 282
 parallel vectors, 322
 parallelogram
 and vector sum, 315
 area of, 328, 416, 428
 parametric equations, 262, 333, 344
 partial fractions, 214
 particular solution, 472
 physicists, 116
 point-slope formula, 524
 polar coordinates, 253, 337
 polynomial
 of two variables, 370
 power function, 57
 power rule, 57
 precedence
 of algebraic operations, 523
 probability density function, 237
 product rule, 62, 63
 generalized, 64
 projection, 437
 scalar, 437
 projection of a vector, 322
 properties of integrals, 147

Q

quadratic formula, 523

quotient rule, 64

R

radian measure, 73
 radius of convergence, 296
 random variable, 236
 rational function, 66, 214
 rectangular coordinates, 253, 337
 related rates, 115
 resonant frequency, 491
 right hand rule, 329
 Rolle's Theorem, 130

S

scalar multiplication, 316
 scalar projection, 437
 second derivative, 97, 98
 separation of variables, 472
 sequence, 270
 bounded, 274
 bounded above, 274
 bounded below, 274
 convergent, 271
 decreasing, 274
 divergent, 271
 increasing, 274
 monotonic, 274
 non-decreasing, 274
 non-increasing, 274
 of partial sums, 276
 series, 270
 p -series, 282
 absolute convergence, 290
 alternating harmonic, 285
 conditional convergence, 290
 convergent, 276
 divergent, 276
 geometric, 276
 harmonic, 279
 integral test, 282
 interval of convergence, 296
 Maclaurin, 300
 radius of convergence, 296
 Taylor, 302
 Simpson's Rule, 221
 sines
 law of, 524
 slope field, 482
 sphere
 surface area, 524

volume, 524
 spherical coordinates, 339, 421

spiral of Archimedes, 255

squeeze theorem, 77

standard deviation, 241

standard normal distribution, 239

standard normal probability density

 function, 238

steady state part of solution to d.e., 490

substitution, 425

subtend, 74

sum

 of vectors, 315

sum rule, 61

surface area, 416

T

tangent line, 32
 Taylor series, 302
 Toricelli's trumpet, 235, 250

torque, 225

torus, 250

transcendental function, 73

transcendental number, 188

transient part of solution to d.e., 490

Trapezoid Rule, 219

triangle inequality, 43, 314

trigonometric identities, 524

U

unbounded function, 54

undetermined coefficients, 487

uniform distribution, 238

uniform probability density function, 238

unit binormal, 358

unit circle, 21

unit normal, 358

unit vector, 323, 350

V

variance, 241

variation of parameters, 477, 491

vector, 314

 anti-parallel, 322

 cross product, 327

 displacement, 315

 function, 344

 normal to a plane, 330

 parallel, 322

 projection, 322

scalar multiplication, 316
sum, 315
unit, 323
vector fields, 433
velocity, 37
velocity vector, 359

W

witch of Agnesi, 66
work, 173