Index

A

absolute extremum, 103
acceleration
  normal component, 321
  tangential component, 321
acceleration vector, 321
algebraic precedence, 477
alternating harmonic series, 249
anti-parallel vectors, 285
antiderivative, 139
arc length, 315
arc length parameterization, 316
arccosine, 81
arcsine, 80
asymptote, 9, 99
average, 376
average height, 357

B

bell curve, 204
binormal, 320, 407
bounded function, 40

C

cardioid, 218
Cartesian coordinates, 217, 299
Cauchy Principal Value, 198
center of mass, 376
center of mass, 193
centroid, 194, 373
chain rule, 53
characteristic polynomial, 439
chord, 18
circle
  area, 477
  circumference, 477
  equation of, 7, 478
  unit, 7
Clairaut's Theorem, 345
closed paths, 397
complete the square, 166
completing the square, 477
composition of functions, 13, 31, 53
concave down, 98
concave up, 98
cone
  lateral area, 478
  surface area, 478
  volume, 478
conservative vector field, 396
continuous, 41
convergent sequence, 235
convergent series, 240
coordinates
  Cartesian, 217, 299
  converting rectangular to polar, 218
  cylindrical, 299
  polar, 217, 299
  rectangular, 217, 299
  spherical, 301
cosines
  law of, 283, 478
critical value, 92

cross product, 289
cumulative distribution function, 204
curvature, 317
curvature formula, 318, 319
cycloid, 227
cylinder
  lateral area, 478
  surface area, 478
  volume, 478
cylindrical coordinates, 378
cylindrical coordinates, 299

D

definite integral, 143
del (∇), 341
dependent variable, 10
derivative, 20
  dot notation, 116
  Leibniz notation, 35
difference quotient, 18
differentiable, 41, 335
differential, 128
differential equation, 425
  first order, 426
  particular solution, 428
  separable, 428
directional derivative, 341
discrete probability, 201
discriminant, 346
displacement vector, 278
divergence test, 242
Divergence Theorem, 420
divergent sequence, 235
divergent series, 240
domain, 9
dot notation, 116
dot product, 284
double integral, 359

E

ellipse
  equation of, 478
ellipsoid, 216
escape velocity, 200
Euler's Method, 435
exp function, 71
expected value, 202
exponential distribution, 205
exponential function, 68
Extreme Value Theorem, 105

F

Fermat's Theorem, 92
flux, 413
frustum, 213
Fubini's Theorem, 361
function, 8
  bounded, 40
  differentiable, 41
  implicit, 75
  linear, 8
  of two variables, 330
  rational, 163
  unbounded, 40
function composition, 13
Fundamental Theorem of Algebra, 95
Fundamental Theorem of Calculus, 137

G

Gabriel's horn, 201, 216
geometric series, 240
global extremum, 103
gradient, 341
greatest integer, 94

H

harmonic series, 243
  alternating, 249
Hooke's Law, 189
hyperbolic cosine, 87
hyperbolic sine, 87
hypercycloid, 228
hypocycloid, 228

I

implicit differentiation, 75, 339
implicit function, 75
improper integral, 197
  convergent, 197
  diverges, 197
incompressible, 406
indefinite integral, 143
independent variable, 10
inflection point, 98
initial condition, 426
initial value problem
  first order, 426
integral
  improper, 197

of $\sec x$, 159
of $\sec^3 x$, 159
properties of, 147
integral sign, 139
integral test, 246
integration
by parts, 160
Intermediate Value Theorem, 41
interval of convergence, 259
inverse function, 68
inverse sine, 80
involute, 228

J

Jacobian, 386
judicious guessing, 442

K

kinetic energy, 199

L

L'Hôpital's Rule, 83
Lagrange multipliers, 351
lateral area of a cone, 114
law of cosines, 283, 478
law of sines, 478
Leibniz notation, 35
level curve, 325
level set, 326
level surface, 326
limit, 27
limit at infinity, 83
limit of a sequence, 235
line integral, 391
linear approximation, 127
linearity of the derivative, 46
local extremum, 91
local maximum, 91
local minimum, 91
logarithm, 68
logarithmic function, 68
logistic equation, 430
long division of polynomials, 165

M

Maclaurin series, 263
mass, 376
mean, 202, 205
Mean Value Theorem, 130
moment, 193, 371, 377

N

Newton, 188
Newton's law of cooling, 425
normal, 293, 320
normal distribution, 209

O

one sided limit, 32
optimization, 103
orientable surface, 414
oriented curve, 399

P

p-series, 246
parallel vectors, 285
parallelogram
and vector sum, 279
area of, 291, 373, 385
parametric equations, 226, 296, 306
partial fractions, 163
particular solution, 428
physicists, 116
point-slope formula, 478
polar coordinates, 217, 299
polynomial
of two variables, 330
power function, 43
power rule, 43, 74, 78
precedence
of algebraic operations, 477
probability density function, 203
product rule, 48, 49
generalized, 50
projection, 393
scalar, 393
projection of a vector, 285
properties of integrals, 147

Q

quadratic formula, 477
quotient rule, 50

R

radian measure, 59
radius of convergence, 259

random variable, 202
rational function, 52, 163
rectangular coordinates, 217, 299
related rates, 115
resonant frequency, 446
right hand rule, 292
Rolle's Theorem, 130

S

scalar multiplication, 280
scalar projection, 393
separation of variables, 428
sequence, 234
bounded, 238
bounded above, 238
bounded below, 238
convergent, 235
decreasing, 238
divergent, 235
increasing, 238
monotonic, 238
non-decreasing, 238
non-increasing, 238
of partial sums, 240
series, 234
p-series, 246
absolute convergence, 254
alternating harmonic, 249
conditional convergence, 254
convergent, 240
divergent, 240
geometric, 240
harmonic, 243
integral test, 246
interval of convergence, 259
Maclaurin, 263
radius of convergence, 259
Taylor, 266
sines
law of, 478
slope field, 437
sphere
surface area, 477
volume, 477
spherical coordinates, 301, 378
spiral of Archimedes, 219
squeeze theorem, 63
standard deviation, 207
standard normal distribution, 205
standard normal probability density function, 204
steady state part of solution to d.e., 444
substitution, 382
subtend, 60
sum
of vectors, 279
sum rule, 47
surface area, 373

T

tangent line, 18
Taylor series, 266
Toricelli's trumpet, 201, 216
torque, 191
torus, 216
transcendental function, 59
transient part of solution to d.e., 444
triangle inequality, 29, 278
trigonometric identities, 478

U

unbounded function, 40
undetermined coefficients, 442
uniform distribution, 204
uniform probability density function, 204
unit normal, 320
unit binormal, 320
unit circle, 7
unit vector, 286, 312

V

variance, 207
variation of parameters, 433, 446
vector, 278
anti-parallel, 285
cross product, 289
displacement, 278
function, 306
normal to a plane, 293
parallel, 285
projection, 285
scalar multiplication, 280
sum, 279
unit, 286
vector fields, 389
velocity, 23
velocity vector, 321

W

witch of Agnesi, 52
work, 187