

Index

• Symbols •

$| |$ (absolute value), 32
 $\{ \}$ (braces), 304
 \wedge (caret), 94–95
 ϵ (epsilon), 324
 $!$ (factorial), 304–305
 $>$ (greater than), 28–29
 \geq (greater than or equal to), 28–29
 ∞ (infinity), 30, 172–173
 $<$ (less than), 28–29
 \leq (less than or equal to), 30
 $[$ (or equal to), 30
 Σ (sigma), 314
 $|$ (vertical bar), 324

• A •

absolute value ($| |$)
definition of, 85
general equation for an, 93
graphing, 93
inequalities, 34–36
minimum/maximum, 103, 135
parabolas, 206
solving equations for, 32–33
adding
complex numbers, 272
matrices, 285
a series, 314–318
a set to a Venn diagram, 333–335
additive
identity, 12, 294
inverse, 13, 293–294
Algebra For Dummies (Sterling), 3, 9, 20, 33, 41, 319, 321
Algebra Workbook For Dummies (Sterling), 150, 163
alternating sequence, 305–306

arithmetic sequence
overview, 309–310
recursive rule of an, 312–313
summing an, 315
associative property, of
addition/multiplication, 10–11
asymptotes
definition of, 158
graphing, 160–163
rational functions and, 159–163
using to solve/graph hyperbolas, 220–221
axes, definition of, 78
axis of symmetry
definition of the, 117–118, 126
of a parabola, 205
of a quadratic function, 126

• B •

bases
most common, 180–181
solving exponential equations by
matching, 182–184
binomial
definition of a, 2, 133
factoring a quadratic, 39–41
using synthetic division with a, 153–154
book
conventions used in this, 2
icons used in this, 5–6
organization of this, 3–5
braces ($\{ \}$), for sequence notation, 304

• C •

calculator, graphing, 93–96
Calculus For Dummies (Ryan), 113, 244
caret (\wedge), on a graphing calculator, 94–95
Cartesian coordinate system, 78

- circle
 - center origin, 214
 - as a conic section, 204
 - definition of a, 213
 - equation of a, 95, 213–214, 223, 252
 - graphing a, 93
 - solving a system with a parabola and a, 251–255
 - coefficients
 - definition of, 2, 87
 - quadratic functions and, 118–120
 - coexisting lines, 231–234
 - column matrices, 282–283
 - combinations
 - notations for, 343–344
 - tree diagram for, 346
 - commutative property, of
 - addition/multiplication, 10
 - complement, of a set, 329
 - completing the square
 - to convert parabolic equations to the standard form, 212
 - definition of, 46
 - solving equations by, 46–49
 - complex numbers, 271–274
 - complex zeros, 279–280
 - composition, of a function, 112
 - compound inequality, 30–31
 - compound interest, 185–188
 - conic sections
 - definition of, 48, 203
 - general equations of, 223–224
 - overview, 203–204
 - conjugate
 - axis of a hyperbola, 219–220
 - overview, 273–274
 - pairs, 278–279
 - constant, definition of, 2
 - continuous compounding formula, 188–189
 - coordinate plane, 78–79
 - counting off, definition of, 87
 - Cramer's Rule (Cramer, Gabriel)
 - definition of, 234–235
 - using to solve a linear system, 236–237
 - cross-products, using to solve rational equations, 62–63
 - cubed equations, 50–51
 - cubes, sum of, 50, 143–144
 - cubic, 90–91
 - curves, graphing lines and, 265–266
- **D** •
- Dantzig, George (Simplex Method), 291
 - denominator
 - definition of a, 166
 - finding a common (as a time-saving trick), 354
 - Descartes' Rule of Signs (Descartes, Rene), 148–149, 279
 - difference
 - of cubes/squares, 40–41, 50, 143–144
 - quotient, 113
 - in sequences, 306–308
 - dimensions, of matrices, 282, 287
 - directrix, of a parabola, 204–205
 - discontinuity
 - definition of a, 160, 165
 - evaluating limits at a, 168–170
 - factoring to remove a, 164–165
 - of a graph, 110
 - distinguishable permutations, formula for, 341–342
 - distributive property, of
 - addition/multiplication, 11–12
 - divide/average method, to find square roots, 275
 - dividing
 - complex numbers using conjugates, 274
 - exponents, 15
 - matrices using inverses, 299–300
 - divisors, determining (as a time-saving trick), 354–355
 - domain. *See also* input variable
 - of a function, 101–102, 158
 - dot mode, of a graphing calculator, 96
 - double root, 42, 250
- **E** •
- e*, 180–181
 - elimination method, 230–231

- ellipse
 components of an, 216
 as a conic section, 204
 definition of an, 215
 determining the shape of an, 217
 finding the foci of an, 217–218
 graphing an, 218–219
 standard equation for an, 216, 223
 empty/null set, 325
 epsilon (ϵ), used in sets, 324
 equation
 absolute value/circle, 93
 changing the form of an, 87–88
 factoring a cubed, 50
 input/output variables of a function, 99–100
 of a parabola and a line, 248
 rule of a logarithmic, 193–194
 solving a large quadratic, 45–46
 solving a line, 86–88
 solving a linear, 24–26, 228
 solving with the multiplicative property of zero, 14
 solving a negative exponent, 70–72
 solving a quadratic-like trinomial, 51
 solving a rational, 57–65
 squaring a radical, 65–68
 standard form for systems of a linear, 225–226
 types of, 65, 90–92
 even functions, 104–105
 exponential
 curve equation, 92
 graphs, 92, 197
 growth/decay, 196
 intersections, 259
 rules, 15–17
 exponential equations
 graphing, 259–260
 rewriting logarithmic equations as, 195
 solving, 182–185
 exponential functions
 bases of, 178–181
 general form of, 178
 graphing, 196–200
 logarithmic functions as inverses of, 198–199
 overview, 177–178
 solving, 260–261
 using to calculate compound interest, 185–188
 exponents
 graphing calculators and, 94–95
 grouping exponential functions by, 180
 use of, 15–17
 expression, definition of, 2
 extraneous root. *See also* extraneous solution
 definition of, 193
 extraneous solution. *See also* extraneous root
 definition of, 58, 263
 indicators of an, 60
- **F** ●
- factor, definition of a, 2
 factorial (!)
 operations, 336–337
 in sequences, 304–305
 simplifying a, 337–338
 factoring
 a cubed equation, 50
 the difference of squares, 40–41
 four (or more) terms, 22
 fractional exponents, 73–75
 by grouping, 42–43
 into the product of two binomials, 75
 for polynomial roots, 143–145
 quadratic equations, 39–43, 185
 three terms, 18–22
 two terms, 17–18
 foci, of an ellipse, 217–218
 focus, of a parabola, 204–205
 FOIL, using, 19–20
 formula
 compound interest, 186–188
 continuous compounding, 188–189
 for distinguishable permutations, 341–342
 special type of, 321–322

Four-Color-Problem, 343
 fractional exponents
 factoring, 73–75
 negative exponents and, 75–76
 use of, 15–16, 73
 fractions
 changing negative exponents to, 69–70
 decomposing with linear systems, 244–246
 graphing calculators and, 94
 linear equations and, 25–26
 function
 absolute minimum/maximum value of a,
 103, 135
 asymptotes and a rational, 159–163
 composition of a, 112
 definition of a, 4, 99
 domain of a, 101–102, 158
 finding the intercepts of a quadratic,
 120–124
 general form of an exponential, 178–179
 general form of a rational, 158
 graphing an even/odd, 105–106
 input/output variables of a, 99–100
 inverse, 114–116
 notation, 100, 172
 one-to-one, 106–107
 piecewise, 108–111
 range of a, 102–103
 removable discontinuities and a rational,
 164–166
 rule of a polynomial, 141–142
 symmetry of a log/exponential, 200
 versus relation, 207

● G ●

geometric sequence
 general formula for a, 311
 summing a, 316–318
 Goldbach's Conjecture, 360
 graphing
 asymptotes, 161–163
 calculator, 93–96
 curves and lines, 265–266
 an ellipse, 218–219
 exponential functions, 196–200, 259–260

hyperbolas, 220–223
 inequalities, 264–265
 lines, 84–89
 logarithmic functions, 196–200
 parabolas, 127–128, 209–211
 quadratic functions, 127–128
 rational functions, 173–175
 solutions of linear systems, 226–229
 graphs
 definition of, 77
 discontinuity of, 110
 for even/odd functions, 105–106
 plotting, 79–80
 of quadratic functions, 117–118
 symmetry of, 82–84
 types of, 90–93
 greater than ($>$)/greater than or equal to
 (\geq), 28–29
 Greatest Common Factor (GCF)
 definition of, 40
 using to factor polynomials, 143–144
 using to factor quadratic binomials, 40
 using to solve quadratic equations,
 184–185
 grouping
 applying, 144
 definition of, 22
 exponential functions, 179–180
 factoring by, 22, 42–43
 symbols and the order of operations,
 13–14

● H ●

horizontal asymptotes, 160–162
 horizontal line test, 107–108
 hyperbola
 as a conic section, 204
 equations of a, 220–224
 graphing a, 222–223
 overview, 219

● I ●

i. See powers, of *i*
 icons, used in this book, 5–6

- identity additive, 12, 294
- identity matrices, 284
- improper subset, definition of an, 326
- inequality
 - graphing an, 264–266
 - overview, 28–29
 - using the sign–line process to solve a rational, 54–56
- infinity (∞)
 - evaluating limits at, 172–173
 - used in interval notation, 30
- initial value. *See* *y*-intercept
- input variable. *See also* domain
 - of a function equation, 99–100
- integer, definition of, 145
- intercepts
 - counting, 136–137
 - definition of, 80
 - of a line and a parabola, 248–250
 - of linear systems, 227
 - of a parabola and a circle, 251–255
 - of a polynomial, 134, 137–139, 142, 257–258
 - quadratic functions and, 120–124
 - rational functions and, 159
- intersection, of sets, 328–329
- interval notation, rules of, 29–30
- inverse
 - additive, 13, 293–294
 - functions, 114–115, 263–264
 - of a matrix, 293–300
 - overview, 13
- irrational
 - number, 44, 127, 145
 - radical value, 39
 - roots, 144–145
 - solutions, 44–45
- **L** ●
- Least Common Denominator (LCD), 58–62
- Least Common Multiple. *See* Least Common Denominator (LCD)
- less than ($<$)/less than or equal to (\leq), 28–29
- limit notation, 167–168
- limits
 - determining without tables, 169
 - evaluating at infinity, 172–173
 - one-sided, 170–171
 - of rational functions, 167–168
- line
 - definition of a, 247–248
 - equations, 86–88, 257
 - graphing a curve and a, 265–266
 - graphs, 90
 - intercepts of a parabola and a, 248–251
 - intercepts of a rational function and a, 261–263
 - slope-intercept equation of a, 90
 - solving a system of equations with a polynomial and a, 256–257
 - tests, 107–108
- linear, definition of, 3
- linear equations
 - applying to the real world, 243–244
 - definition of, 225
 - fractions and, 25–26
 - generalized solution for, 239–240
 - graphing, 226–229
 - intercepts of, 227
 - parallel lines and, 228–229
 - slope-intercept form and, 229
 - solving basic, 24–25
 - solving matrices with, 300–302
 - solving multiple variable, 241–243
 - solving systems of two, 229–234
 - solving three-equation, 237–239
 - standard form for a system of, 225–226
 - using Cramer’s Rule to solve, 235–237
 - using to decompose fractions, 244–246
- linear inequality, 28–29, 264–266
- log equations. *See* logarithmic, equations
- log functions. *See* logarithmic, functions
- log notation, 192
- logarithmic
 - curves, 92
 - equations, 190–195
 - functions, 196–200
- logarithms
 - common, 194
 - properties of, 189–190

• **M** •

- m (slope), 86–90, 229
- major/minor axis, of an ellipse, 216
- matrices
 - adding/subtracting, 285
 - additive inverse of, 294
 - applying to the real world, 288–292
 - definition of, 281
 - dimensions of, 282, 287
 - identity, 284
 - multiplicative identity of, 294–296
 - multiplying, 286–288
 - naming, 282
 - performing row operations on, 292–293
 - row/column, 282–283
 - solving, 296–299
 - square, 283
 - using inverses to divide, 299–300
 - using to solve linear equations, 300–302
 - zero, 283
- matrix. *See* matrices
- monomial, definition of a, 3
- multiple roots, definition of, 139
- multiples
 - of 9 pattern (as a time-saving trick), 350
 - in a sequence, 308–309
- multiplication principle, sets and the, 338–339
- multiplication property of zero, 14, 138
- multiplicative identity/inverse, 12, 294–299
- multiplying
 - complex numbers, 272–273
 - exponents, 15
 - matrices and, 286–288
 - time-saving tricks of, 349–355

• **N** •

- natural logarithms (\ln), 190
- negative
 - exponents, 17, 69–76
 - on a graphing calculator, 95
 - intervals, 139–142
 - numbers, 14

- reciprocals, 89
- values of polynomials, 139
- notation
 - combinations, 343–344
 - function, 100
 - function for infinity, 172
 - interval, 29–30
 - for inverse functions, 114
 - limit, 167–168
 - log, 192
 - one-sided limit, 171
 - sequence, 304
 - set, 323–327
 - summation, 314
- null/empty set, 325
- numbers, types of, 357–360
- numerator, definition of, 166

• **O** •

- oblique asymptote, 162–163
- odd functions, 104–106
- one-sided limits, 170–171
- one-to-one functions, 106–107
- or equal to (\cup), used in interval notation, 30
- order of operations, 13–14, 94
- ordered
 - pairs, 79
 - quintuple, 243
 - triple, 239
- origin
 - definition of, 78
 - symmetry and the, 84
- output variable. *See also* range of a function, 99–100

• **P** •

- parabola
 - absolute value operation and a, 206
 - applying to the real world, 211
 - as a conic section, 204
 - definition of a, 90, 117, 204, 247
 - directrix of a, 204–205
 - features of a, 204–208

- graphing a , 127–128, 209–211
 - intercepts of a , 276–277
 - intersection of a line and a , 248–250
 - and line equations, 250–251
 - solving systems of equations that include
 - a circle and a , 252–255
 - standard form of a , 124, 206–209, 212, 223, 252
 - vertex of a , 119, 124
 - parallel lines
 - identifying, 88–89, 233–234
 - linear systems and, 228–229
 - solutions for, 231–232
 - perfect square trinomial
 - definition of a , 41–42
 - finding a , 19
 - using on polynomials, 143–144
 - permutation
 - sets and, 339–343
 - tree diagram for a , 345
 - perpendicular lines, identifying, 88–89
 - piecewise functions, 108–111
 - point of inflection, definition of, 279–280
 - polynomial
 - finding the roots of, 146–147
 - inequalities, 53–54
 - intercepts of, 134, 137–139, 142
 - intersecting, 257–258
 - roots, 143–145
 - solving equations containing two, 258
 - solving systems of equations with lines and, 256–257
 - unfactorable forms of a , 144–145
 - using the Rule of Signs to find roots of a , 148–149
 - using synthetic division on a , 150–154
 - polynomial equations
 - definition of, 49
 - solving complex, 278–280
 - polynomial function
 - rule of a , 141–142
 - solving the intercepts of a , 137–139
 - standard form of a , 133–134
 - positive intervals, using a sign line to determine, 139–142
 - powers
 - of i , 269–271
 - overview, 16
 - raising to, 74
 - in a sequence, 308–309
 - prime, definition of, 19
 - Probability For Dummies* (Rumsey), 338
 - proper subset, definition of a , 326
 - proportion
 - definition of, 62, 263
 - solving rational equations with a , 64–65
- *Q* •
- quadrants, definition of, 78
 - quadratic
 - binomials, 39–41
 - definition of, 3
 - formula, 43–46
 - graphs, 90
 - inequalities, 52–56
 - patterns, in exponential equations, 184
 - quadratic equations
 - definition of, 37
 - factoring, 39–43
 - solving by completing the square, 46–48
 - solving with complex solutions, 276–278
 - solving large, 45–46
 - solving with the square root rule, 38–39
 - using the GCF to solve, 184–185
 - quadratic functions
 - applying to the real world, 129–132
 - axis of symmetry and, 126
 - definition of, 117
 - graphing, 117–118, 127–128
 - intercepts and, 120–124
 - locating the vertex in, 124–125
 - rules to identify the lead coefficient in a , 118–119
 - solving for its intercepts, 120–124, 276–278
 - standard form of, 124
 - quadratic-like trinomials equations,
 - solving, 51, 71–72

quadratic trinomials
 definition of, 18, 185
 factoring, 18–19, 41–42, 185
 finding two solutions in, 41
 quartic, 90–91

• R •

radical
 curve, 91
 entering on a graphing calculator, 95
 equations, squaring, 65–68
 expressions, 15–16
 graphs, 91–92
 simplifying a, 275–276
 value, 39
 range. *See also* output variable
 of a function, 102–103
 rational
 curve, 92
 graphs, 91–92
 inequalities, 53–56
 numbers, 44, 145, 157
 solutions, 44
 term, 57
 rational equations
 definition of, 57
 fractions and, 57–58
 reciprocating, 65
 solving, 58–65
 rational functions
 asymptotes and, 159–163
 definition of, 261
 domains of, 158
 evaluating limits at infinity in, 172–173
 general form of, 158
 graphing, 173–175, 261
 intercepts of, 159
 intersections of a line and a, 261–263
 as inverses of one another, 263–264
 limits of, 167–168
 one-sided limits of, 170–171
 overview, 157–158
 removable discontinuities and, 164–166
 Rational Root Theorem, 145–148
 real number, definition of, 148, 269
 recursive rule, 312–313

relations
 of a parabola, 205
 versus functions, 207
 relative minimum/maximum, definition of, 135
 Remainder Theorem, 154–155
 removable discontinuities, 164–166
 roots
 overview, 52
 of a polynomial, 134, 142, 146–147
 using synthetic division to test for, 150–153
 roster notation, of a set, 324
 row
 matrices, 282–283
 operations, on matrices, 292–293
 rule notation, of a set, 324
 Rule of Signs (Descartes, Rene), 148–149, 279
 Rumsey, Deborah (*Probability For Dummies*), 338
 Ryan, Mark (*Calculus For Dummies*), 113, 244

• S •

scalar multiplication, of a matrix, 286
 sense, definition of, 29
 sequence
 alternating, 305–306
 applying to the real world, 318–321
 arithmetic, 309–310, 315
 definition of a, 303–304
 difference of terms in a, 307–308
 factorial (!), 304–305
 general formula for a geometric, 311–312
 locating patterns in a, 306–309
 notation, 304
 summing a, 315–318
 series
 adding/summing a, 314–318
 definition of a, 303, 313
 set
 basic operations on a, 327–330
 combinations in a, 343–344
 counting the elements in a, 329–330
 counting permutations of a, 339–343

- definition of a , 323
- finding the complement of a , 329
- finding the union of a , 327–328
- intersections of a , 328–329
- multiplication principle and a , 338–339
- notation, 323–327
- universal/empty/null, 325
- using a Venn diagram with a , 332–335
- sigma (Σ), used in summing sequences, 314
- sign-line
 - using to determine positive/negative intervals, 139–141
 - using to solve rational inequalities, 54–56
- simplex method (Dantzig, George), 291
- simplifying
 - definition of, 3
 - expressions with a base of e , 181
 - factorials, 337–338
 - logarithmic equations, 190–192
 - powers of i , 270–271
 - radicals, 16, 275–276
- slant asymptote, graphing, 162–163
- slope-intercept
 - equation of a line, 86–90
 - linear systems and the, 229
- slope (m), 85–86
- solving
 - 2×2 matrices, 298–299
 - absolute value equations, 32–33
 - absolute value inequalities, 34–36
 - basic inequalities, 28–29
 - cubed equations, 50–51
 - equations containing negative exponents, 69–72
 - equations with the multiplicative property of zero, 14
 - equations with negative exponents, 70–71
 - equations with two polynomials, 258
 - equations by working with fractional exponents, 74–76
 - exponential equations, 182–185
 - for exponential functions, 260–261
 - inequalities, 52–56
 - for the inverse of a function, 115–116
 - line equations, 86–88, 256–257
 - logarithmic equations, 193–195
 - parabola and circle equations, 252–255
 - for polynomial intercepts, 137–139
 - quadratic-like trinomial equations, 51, 71–72
 - three-equation linear systems, 237–239
- solving linear equations
 - basic, 24–26
 - with multiple variables, 241–243
 - using Cramer's Rule, 235–237
 - using matrices, 300–302
- solving polynomial equations
 - with complex solutions, 278–280
 - with substitution, 256–257
- solving quadratic equations
 - with complex solutions, 276–278
 - with large numbers, 45–46
 - with the square root rule, 38–39
 - by using the GCF, 184–185
- solving rational equations
 - with proportions, 62–65
 - using the LCD, 58–62
- square
 - finding the next perfect (as a time-saving trick), 350
 - matrix, 283
 - numbers, 358
 - roots, 38–39, 275–276
- squaring
 - numbers that end in 5 (as a time-saving trick), 349–350
 - radical equations, 65–68
- Sterling, Mary Jane
 - (*Algebra For Dummies*), 3, 9, 20, 33, 41, 319, 321
 - (*Algebra Workbook For Dummies*), 150–163
- subsets, 325–326
- substitution method, 232–234
 - solving parabola/circle systems with the, 253–254
 - solving polynomial/line equations with the, 257
- subtracting
 - complex numbers, 272
 - on a graphing calculator, 95
 - matrices, 285
- sum of cubes, 50, 143–144

summation notation, 314
 superset, definition of a, 325
 synthetic division
 definition of, 149–150
 Remainder Theorem and, 154–155
 using to divide a polynomial by a
 binomial, 153–154
 using to test for roots in a polynomial,
 150–153
 system of equations, definition of, 225

• T •

tangent, 249–250
 10, as an exponential function base,
 180–181
 term, definition of, 3
 time-saving tricks, 349–355
 transverse axis, of a hyperbola, 219–220
 tree diagram, 344–346
 trinomial
 definition of a, 3, 18, 71, 133
 factoring a, 18–19, 143–144
 factoring a quadratic, 41–42
 finding two solutions in a, 41
 unFOILing a, 20–22
 turning points
 counting, 136–137
 of a polynomial, 135

• U •

UnFOILing, 20–22
 union, of sets, 327–328
 unit circle, definition of a, 214
 universal set, 325

• V •

variable
 definition of, 3
 linear equation with one, 23–24
 Venn diagram
 adding a set to a, 333–335
 applying to the real world, 331–332
 overview, 330
 using with set operations, 332–333

vertex
 locating in quadratic functions, 124–125
 of a parabola, 119, 205
 vertical
 asymptotes, 160–162
 bar (|) used in sets, 324
 line test, 107
 vertices. *See also* vertex
 of an ellipse, 216
 vulgar fraction, definition of, 166

• X •

x -axis
 definition of, 78
 symmetry and the, 82–83
 x -coordinate, definition of, 79
 x -intercept
 graphing calculator and the, 96
 overview, 80–81
 of a rational function, 159
 solving for in a polynomial function,
 134, 138–139
 solving for in a quadratic function,
 122–124, 276–277

• Y •

y -axis
 definition of, 78
 symmetry and the, 82
 y -coordinate, definition of, 79
 y -intercept
 overview, 80–81
 of a rational function, 159
 solving for in a polynomial function,
 134, 137–138
 solving for in a quadratic function,
 120–121, 277–278

• Z •

zero
 matrix, 283, 294
 multiplicative property of, 14
 overview, 52
 of a polynomial, 134, 142