# Index

Absolute Value Functions, 149

Graphing, 150

Solving, 151

Solving Inequalities, 152

Ambiguous Case, 501

Amplitude, 399, 402

Angle, 347

Coterminal Angles, 348

Degree, 347

Radian, 351

Reference Angles, 369

Standard Position, 347

Angular Velocity, 356

Annual Percentage Rate (APR), 257

Annual Percentage Yield (APY), 259

Arclength, 350

Arcsine, Arccosine and Arctangent, 423

Area of a Sector, 355

asymptotes of hyperbola, 598

Average Rate of Change, 37

axis of symmetry, 617

Cauchy's Bound, 203

central rectangle, 598

Change of Base, 281, 289

Circles, 338, 518

Area of a Sector, 355

Equation of a Circle, 338

Points on a Circle, 339, 364

Polar Coordinates, 518

Coefficients, 162

Cofunction Identities, 387

Common Log, 279

completing the square, 170

Completing the square, 170

Complex Conjugate, 212, 530

Complex Factorization Theorem, 214

Complex Number, 210, 528

Complex Plane, 529

Component Form, 544

Composition of Functions, 51

Formulas, 54

Tables and Graphs, 52

Compound Interest, 257

Concavity, 43

conic section, 579

Continuous Growth, 260

Correlation Coefficient, 144, 145

Cosecant, 375

Cosecant Function

Domain, 415

Range, 415

Cosine, 363, 385, 398

Cotangent, 375

Cotangent Function

Domain, 416

Period, 416

Range, 416

Coterminal Angles, 348

co-vertices, 580

Damped Harmonic Motion, 492

Decreasing, 40

Degree, 162, 347

Difference of Logs Property, 289

directrix, 617, 630

Domain, 22

Dot Product, 555

Double Angle Identities, 477

Double Zero, 183

Doubling Time, 311

eccentricity, 630

ellipse, 580, 617, 630, 631, 632

Even Functions, 73

Exponential Functions, 249

Finding Equations, 253

Fitting Exponential Functions to Data, 331

Graphs of Exponential Functions, 267

Solving Exponential Equations, 282

Transformations of Exponential Graphs, 270

Exponential Growth or Decay Function, 251

Exponential Property, 289

Extrapolation, 142

Extrema, 41, 187

Factor Theorem, 196

factored completely, 215

focal length, 617

foci, 598

Function, 1

Absolute Value Functions, 149

Composition of Functions, 51

Domain and Range, 22

Exponential Functions, 249

Formulas as Functions, 8

Function Notation, 3

Graphs as Functions, 6

Horizontal Line Test, 7

Inverse of a Function, 93

Linear Functions, 101, 103

Logarithmic Functions, 277

One-to-One Function, 2

Parametric Functions, 564

Periodic Functions, 395

Piecewise Function, 29

Polar Functions, 517

Power Functions, 159

Quadratic Functions, 167

Radical Functions, 239, 240

Rational Functions, 218, 221

Sinusoidal Functions, 397

Solving & Evaluating, 5

Tables as Functions, 4

Tangent Function, 413

Vertical Line Test, 7

Fundamental Theorem of Algebra, 213

Half-Angle Identities, 483

Half-Life, 308

Horizontal Asymptote, 219, 224

Horizontal Intercept, 118

Horizontal Line Test, 7

Horizontal Lines, 119

hyperbola, 598

Imaginary Number, 210, 528

Complex Conjugate, 212, 530

Complex Number, 210, 528

Complex Plane, 529

Polar Form of Complex Numbers, 531

Increasing, 40

Inflection Point, 43

Intercepts, 173, 181, 182, 186, 225

Graphical Behavior, 182

Writing Equations, 186

Interpolation, 142

Interval Notation, 24

Union, 24

Inverse of a Function, 93

Properties of Inverses, 96

Inverse Properties, 289

Inversely Proportional, 218

Inversely Proportional to the Square, 218

Inverses, 239

irreducible quadratic, 215

Law of Cosines

Generalized Pythagorean Theorem, 503

Law of Sines

Ambiguous Case, 501

Leading Coefficient, 162

Leading Term, 162

Least-Square Regression, 143

Limaçons, 519

Linear Functions, 101, 103

Fitting Linear Models to Data, 141

Graphing, 114

Horizontal Intercept, 118

Horizontal Lines, 119

Least-Square Regression, 143

Modeling, 129

Parallel Lines, 120

Perpendicular Lines, 120

Veritcal Lines, 119

Vertical Intercept, 115

Linear Velocity, 356

Lissajous Figure, 567

Local Maximum, 41

Local Minimum, 41

Logarithmic Functions, 277

Change of Base, 281, 289

Common Log, 279

Difference of Logs Property, 289

Exponential Property, 280, 289

Graphs of Logarithmic Functions, 300

Inverse Properties, 277, 289

Logarithmic Scales, 314

Log-Log Graph, 329

Moment Magnitude Scale, 318

Natural Log, 279

Orders of Magnitude, 317

Semi-Log Graph, 329

Sum of Logs Property, 289

The Logarithm, 277

Transformations of the Logarithmic Function, 302

Log-Log Graph, 329

Long Division, 194

Long Run Behavior, 161, 163, 219

major axis, 580

Mathematical Modeling, 101

Midline, 400, 402

minor axis, 580

Model Breakdown, 143

Moment Magnitude Scale, 318

multiplicity, 183

Natural Log, 279

Negative Angle Identities, 454

Newton's Law of Cooling, 313

Nominal Rate, 257

oblique asymptote, 230

Odd Functions, 73

One-to-One Function, 2, 7

Orders of Magnitude, 317

orthogonal, 557

Parallel Lines, 120

Parametric Functions, 564

Converting from Parametric to Cartesian, 568

Lissajous Figure, 567

Parameterizing Curves, 570

Period, 395, 402

Periodic Functions, 395

Period, 395

Sinusoidal, 397

Perpendicular Lines, 120

Phase Shift, 406

Piecewise Function, 29

Polar Coordinates

Converting Points, 515

Polar Form of a Conic, 630

Polar Functions, 517

Converting To and From Cartesian Coordinates, 520

Limaçons, 519

Polar Form of Complex Numbers, 531

Roses, 519

Polynomial, 162

Coefficients, 162

Degree, 162

Horizontal Intercept, 183, 186

Leading Coefficient, 162

Leading Term, 162

Long Division, 194

Solving Inequalities, 184

Term, 162

Power Functions, 159

Characterisitcs, 160

Power Reduction Identities, 483

Product to Sum Identities, 468

Projection Vector, 559

Pythagorean Identity, 364, 379

Alternative Forms, 379, 454, 456

Pythagorean Theorem, 337

Quadratic Formula, 175

Quadratic Functions, 167

Quadratic Formula, 175

Standard Form, 169, 170

Transformation Form, 169

Vertex Form, 169

Radian, 351

Radical Functions, 239, 240

Range, 22

Rate of Change, 36

Average, 37

Using Function Notation, 38

Rational Functions, 218, 221

Intercepts, 225

Long Run Behavior, 223

Rational Roots Theorem, 204

Reciprocal Identities, 454

Reference Angles, 369

Remainder Theorem, 196

roots, 164

Roses, 519

Scalar Product, 555

Secant, 375

Secant Function

Domain, 415

Range, 415

Semi-Log Graph, 329

Set-Builder Notation, 24

Short Run Behavior, 164, 167, 173, 181, 219

Sign of the Dot Product, 558

Sine, 363, 385, 398

Single Zero, 183

Sinusoidal Functions, 397

Amplitude, 399, 402

Damped Harmonic Motion, 492

Midline, 400, 402

Modeling, 443

Period, 395, 402

Phase Shift, 406

Solving Trig Equations, 437

slant asymptote, 230

Slope, 103, 104, 115

Decreasing, 103

Increasing, 103

Standard Form, 169, 170

Standard Position, 347

Sum and Difference Identities, 461

Sum of Logs Property, 289

Sum to Product Identities, 469

synthetic division, 198

Tangent, 375, 385

Tangent Function, 413

Domain, 413

Period, 413

Range, 413

Term, 162

The Logarithm, 277

Toolkit Functions, 11

Domains and Ranges of Toolkit Functions, 27

Transformation Form, 169

Transformations of Functions, 64

Combining Horizontal Transformations, 79

Combining Vertical Transformations, 79

Horizontal Reflections, 71

Horizontal Shifts, 67

Horizontal Stretch or Compression, 77

Vertical Reflections, 71

Vertical Shifts, 65

Vertical Stretch or Compression, 75

transverse axis, 598

Trigonometric Identities, 376

Alternative Forms of the Pythagorean Identity, 379, 454, 456

Cofunction Identities, 387

Double Angle Identities, 477

Half-Angle Identities, 483

Negative Angle Identities, 454

Power Reduction Identities, 483

Product to Sum Identities, 468

Pythagorean Identity, 364

Reciprocal Identities, 454

Sum and Difference Identities, 461

Sum to Product Identities, 469

Trigonometry

Cosecant, 375

Cosine, 363, 385, 398

Cotangent, 375

Right Triangles, 385, 597

Secant, 375

Sine, 363, 385, 398

SohCahToa, 385

Solving Trig Equations, 437

Tangent, 375, 385

The Pythagorean Theorem, 337

Unit Circle, 369

Triple Zero, 183

Unit Circle, 369

Vector, 541, 544

Adding Vectors Geometrically, 542

Adding, Subtracting, or Scaling Vectors in Component Form, 547

Geometrically Scaling a Vector, 543

Vertex, 167, 169

Vertex Form, 169

Vertical Asymptote, 219, 222

Vertical Intercept, 115

Vertical Line Test, 7

Vertical Lines, 119

Vertices, 580, 598, 617

Work, 560

zeros, 164