Pre-Calculus Scope and Sequence

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Text: PreCalculus, Larson/Hostetler, 6th Edition

Chapter 1: Functions and Their Graphs

Sec. 1.1 Graphs of Equations
- Graphing using tables
- Intercepts
- Symmetry
- Circles
- Application

Sec. 1.2 Linear Equations in 2 Variables
- Using Slope
- Finding the Slope
- Writing Linear Equations
- Parallel & Perpendicular lines
- Application

Sec. 1.3 Functions
- Introductions to Functions
- Function Notation
- Domain of a Function
- Applications

Sec. 1.4 Analyzing Graphs of Functions
- Graph of a Function
- Zeros of a Function
- Increasing and Decreasing Functions
- Even and Odd Functions

Sec. 1.5 A Library of Functions
- Linear and Squaring Functions
- Cubic, Square Root, and Reciprocal Functions
- Step and Piecewise-defined Functions
- Common Functions

Sec. 1.6 Shifting, Reflecting, and Stretching Graphs
- Shifting Graphs
- Reflecting Graphs
- Nonrigid Transformations

Sec. 1.7 Combinations of Functions
- Arithmetic Combinations of Functions
- Composition of Functions
- Application
Sec. 1.8 Inverse Functions
Inverse Functions
Graph of an Inverse Function
One-to-One Functions
Finding Inverse Functions Algebraically

Sec. 1.9 Mathematical Modeling
Introduction
Direct Variation
Direct Variation as an Nth Power
Inverse Variation
Joint Variation

CHAPTER 1 REVIEW

Chapter 2: Polynomial and Rational Functions

Sec. 2.1 Quadratic Functions
Graph of a Quadratic Function
Standard Form of a Quadratic Function
Application

Sec. 2.2 Polynomial Functions of Higher Degree
Graphs of Polynomial Functions
Leading Coefficient Test
Zeros of Polynomial Functions
Intermediate Value Theorem

Section 2.3 Polynomial and Synthetic Division
Long Division of Polynomials
Synthetic Division
The Remainder and Factor Theorems

Section 2.4 Complex Numbers
The Imaginary Unit i
Operations with Complex Numbers
Complex Conjugates
Complex Solutions of Quadratic Equations

Sec. 2.5 Zeros of Polynomial Functions
The Fundamental Theorem of Algebra
The Rational Zero Test
Conjugate Pairs
Factoring a Polynomial
Other Tests of Zeros of Polynomials

Sec. 2.6 Rational Functions
Horizontal and Vertical Asymptotes
Analyzing Graphs of Rational Functions
Slant Asymptotes
Applications
Chapter 3: Exponential and Logarithmic Functions

Sec. 3.1 Exponential Functions and Their Graphs
- Exponential Functions
- Graphs of Exponential Functions
- Natural Base e
- Applications

Sec. 3.2 Logarithmic Functions and Their Graphs
- Logarithmic Functions
- Graphs of Logarithmic Functions
- The Natural Logarithmic Function
- Application

Sec. 3.3 Properties of Logarithms
- Change of Base
- Properties of Logarithms
- Rewriting Logarithmic Expressions
- Application

Sec. 3.4 Exponential and Logarithmic Equations
- Introduction
- Solving Exponential Equations
- Solving Logarithmic Equations
- Application

Chapter 4: Trigonometry

Sec. 4.1 Radian and Degree Measure
- Angles
- Radian Measure
- Degree Measure
- Applications

Trigonometric Functions: The Unit Circle
- The Unit Circle
- Trigonometric Functions
- Domain and Period of Sine and Cosine
- Evaluating Trigonometric Functions With a Calculator

Sec. 4.3 Right Triangle Trigonometry
- The Six Trigonometric Functions
- Trigonometric Identities
Evaluating Trigonometric Functions with a Calculator
Applications Involving Right Triangles

Sec. 4.4 Trigonometric Functions of Any Angle
   Introduction
   Reference Angles
   Trigonometric Functions of Real Numbers

Sec. 4.5 Graphs of Sine and Cosine Functions
   Basic Sine and Cosine Curves
   Amplitude and Period
   Translation of Sine and Cosine Curves
   Mathematical Modeling

Sec. 4.6 Graphs of other Trig Functions
   Graph of the Tangent Function
   Graph of the Cotangent Function
   Graphs of Reciprocal Functions
   Damped Trigonometric Graphs

Sec. 4.7 Inverse Trigonometric Functions
   Inverse Sine Function
   Other Inverse Trigonometric Functions
   Composition of Functions

Sec. 4.8 Applications and Models
   Applications Involving Right Triangles
   Trigonometry and Bearings
   Harmonic Motion

CHAPTER 4 REVIEW

Chapter 5: Analytic Trigonometry

Sec. 5.1 Using Fundamental Identities
   Introduction
   Using the Fundamental Identities

Sec. 5.2 Verifying Trig Identities
   Introduction
   Verifying Trigonometric Identities

Sec. 5.3 Solving Trig Equations
   Introduction
   Equations of Quadratic Type
   Functions Involving Multiple Angles
   Using Inverse Functions

Sec. 5.4 Sum and Difference Formulas
   Using sum and Difference Formulas
Sec. 5.5 Multiple-Angle and Product-to-Sum Formulas
   Multiple-Angle Formulas
   Power-Reducing formulas
   Half-Angle Formulas

CHAPTER 5 REVIEW

Chapter 6: Additional Topics in Trigonometry

Sec. 6.1 Law of Sines
   Introduction
   The Ambiguous Case (SSA)
   Area of an Oblique Triangle
   Application

Sec. 6.2 Law of Cosines
   Introduction
   Applications
   Heron's Area Formula

Sec. 6.3 Vectors in the plane
   Introduction
   Component Form of a Vector
   Vector Operations

Sec. 6.4 Vectors and Dot Products
   The Dot Product of Two Vectors
   The Angle Between Two Vectors

CHAPTER 6 REVIEW

Chapter 7: Systems of Equations and Inequalities

Sec. 7.1 Solving Systems of Equations
   The Method of Substitution
   Graphical Approach to Finding Solutions
   Applications

Sec. 7.2 Two-Variable Linear Systems
   The Method of Elimination
   Graphical Interpretation of Solutions
   Applications

Sec. 7.3 Multivariable Linear Systems
   Row-Echelon Form and Back-Substitution
   Gaussian Elimination
   Nonsquare Systems
   Applications

Sec. 7.4 Systems of Inequalities
Chapter 8: Matrices and Determinants

Sec. 8.1 Matrices and Systems of Equations
- Matrices
- Elementary Row Operations
- Gaussian Elimination with Back-Substitution
- Gauss-Jordon Elimination

Sec. 8.2 Operations with Matrices
- Equality of Matrices
- Matrix Addition and Scalar Multiplication
- Matrix Multiplication
- Applications

Sec. 8.3 The Inverse of a Square Matrix
- The Inverse of a Matrix
- Finding Inverse Matrices
- The Inverse of a 2 x 2 Matrix
- Systems of Linear Equations

Sec. 8.4 The Determinant of a Square Matrix
- The Determinant of a 2 x 2 Matrix
- Minors and Cofactors
- The Determinant of a Square Matrix

Sec. 8.5 Applications of Matrices and Determinants
- Cramer’s Rule
- Area of a Triangle
- Lines in a Plane
- Cryptography

Chapter 9: Sequences, Series, and Probability

Sec. 9.1 Sequences and Series
- Sequences
- Factorial Notation
- Summation Notation
- Application
Sec. 9.2 Arithmetic Sequences and Partial Sums
   Arithmetic Sequences
   The Sum of a Finite Arithmetic Sequence
   Applications

Sec. 9.3 Geometric Sequences and Series
   Geometric Sequences
   The Sum of a Finite Geometric Sequence
   Geometric Series
   Application

Sec. 9.5 The Binomial Theorem
   Binomial Coefficients
   Pascal's Triangle
   Binomial Expansions

Sec. 9.6 Counting Principles
   Simple Counting Problems
   The Fundamental Counting Principle
   Permutations
   Combinations

Sec. 9.7 Probability
   The Probability of an Event
   Mutually Exclusive Events
   Independent Events
   The Complement of an Event

CHAPTER 9 REVIEW

Chapter 10: Topics in Analytic Geometry

Sec. 10.1 Lines
   Inclination of a Line
   The Angle Between Two Lines
   The Distance Between a Point and a Line

Sec. 10.2 Introduction to Conics: Parabolas
   Conics
   Parabolas
   Application

Sec. 10.3 Ellipses
   Introduction
   Application
   Eccentricity

Sec. 10.4 Hyperbolas
   Introduction
   Asymptotes of a Hyperbola
   Applications
   General Equations of Conics

Sec. 10.6 Parametric Equations
   Plane Curve
Sec. 10.7 Polar Coordinates
  Introduction
  Coordinate Conversion
  Equation Conversion

Sec. 10.8 Graphs of Polar Equations
  Introduction
  Symmetry
  Zeros and Maximum r-Values
  Sketch Polar Graphs