

# Pre-Calculus Scope and Sequence

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**Text:** PreCalculus, Larson/Hostetler, 6<sup>th</sup> 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 2 REVIEW

# 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 3 REVIEW

# 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**

The Graph of an Inequality  
Systems of Inequalities  
Applications

**Sec. 7.5 Linear Programming**

Linear Programming: A Graphical Approach  
Applications

**CHAPTER 7 REVIEW**

## **Chapter 8: Matrices and Determinants**

**Sec. 8.1 Matrices and Systems of Equations**

Matrices  
Elementary Row Operations  
Gaussian Elimination with Back-Substitution  
Gauss-Jordan 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  $2 \times 2$  Matrix  
Systems of Linear Equations

**Sec. 8.4 The Determinant of a Square Matrix**

The Determinant of a  $2 \times 2$  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 8 REVIEW**

## **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

Sketching a Plane Curve  
Eliminating a Parameter  
Finding Parametric Equations for Graph

**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