

# College Algebra

## 0. Review

### 0.1 Real Number System

- 0.1.1 Real Number System
- 0.1.2 Real Number Line
- 0.1.3 Ordering of the Real Numbers
- 0.1.4 Intervals on the Number Line
- 0.1.5 Union and Intersection of intervals

### 0.2 Absolute Value

- 0.2.1 The Absolute Value of a Real Number
- 0.2.2 The Absolute Value of an Algebraic Quantity (Expression)
- 0.2.3 The Properties of Absolute Value

### 0.3 Geometry Essentials

- 0.3.1 Meaning of Terms Used in Geometry and Types of Angles
- 0.3.2 Types of Angles

### 0.4 Polynomials and Factoring

- 0.4.1 Algebraic Expressions
- 0.4.2 Power Expressions
- 0.4.3 Polynomial Expressions
- 0.4.4 Algebra of Polynomials
- 0.4.5 Factoring
- 0.4.6 Evaluating a Polynomial
- 0.4.7 The value of a Polynomial expression when  $|x|$  is large

### 0.5 Rational Expressions

- 0.5.1 Reduction of a Rational Expression
- 0.5.2 Addition and Subtraction of Rational Expressions
- 0.5.3 Complex Fractions
- 0.5.4 Evaluating a Rational Expression

### 0.6 Long and Synthetic Division

- 0.6.1 Long Division
- 0.6.2 Synthetic Division
- 0.6.3 The Remainder Theorem
- 0.6.4 Complementary Factor
- 0.6.5 Evaluating A Rational Expression (Revisited)

### 0.7 Radical Expressions

- 0.7.1 Notation for Radicals
- 0.7.2 Simplifying Radicals
- 0.7.3 Rational Exponents

0.7.4 Rationalizing Denominator

0.7.5 Evaluating A Radical Expression

## **1. Equations and Inequalities**

### **1.1 Solving Linear Equations in One Variable**

1.1.1 Identify and Verify Solutions of Linear Equations

1.1.2 Solve One-Step Equations

1.1.3 Solving Equations of the Type  $ax + b = c$

1.1.4 Use Distributive Property to Solve Equations

1.1.5 Solve General Linear Equations

1.1.6 Solve Equations with Fractions and Decimals

1.1.7 Equations with No Solutions or many Solutions

### **1.2 Solve Quadratic Equations using Zero Property**

1.2.1 Zero Factor Property

1.2.2 Solving Quadratic Equations

1.2.3 Zero Factor Property for more than two Factors

### **1.3 Solve Quadratic Equations by Completing the Square/Quadratic Formula**

1.3.1 Solve Equations  $x^2 = k$  and  $(ax + b)^2 = k$

1.3.2 Solve  $x^2 + bx + c = 0$  by Completing Square

1.3.3 Solve  $ax^2 + bx + c = 0$  by Completing Square

1.3.4 Solve Using the Quadratic Formula

### **1.4 Equation Reducible to Quadratic Form and Applications**

1.4.1 Solve Equations Reducible to Quadratic Equations on Factoring

1.4.2 Solve Equations Reducible to Quadratic Equation on Substitution

1.4.3 Solve Equations which contain Variable Expressions in the Denominator and can be reduced to Q

1.4.4 Solve Application Problems

### **1.5 Complex Numbers**

1.5.1 Define and Identify Complex Numbers

1.5.2 Add and Subtract Complex Numbers

1.5.3 Multiply Complex Numbers

1.5.4 Find Quotients of Complex Numbers

### **1.6 Equations With Radicals**

1.6.1 Solve Equations With Radicals

### **1.7 Absolute Value Equations and Inequalities**

1.7.1 Solve Simple Equations Involving Absolute Value

1.7.2 Solve Simple Inequalities Involving Absolute Value

1.7.3 Absolute Value Equations or Inequalities with No Solution

### **1.8 Applications of Linear Equations**

1.8.1 Applications of Linear Equations

## **2. Graphs**

### **2.1 Distance and Midpoint**

2.1.1 The Distance between two points

2.1.2 The Midpoint of a line segment

### **2.2 Graph Linear Equations in Two Variables**

2.2.1 Graphing a Linear Equation using Points

2.2.2 Graphing a Linear Equation using Intercepts

### **2.3 Slope of a Line/ Recognize Parallel and Perpendicular Lines**

2.3.1 Slope of a Line Through Two Given Points

2.3.2 Slopes of Parallel and Perpendicular Lines

### **2.4 Equation of a Line**

2.4.1 Slope-Intercept Form Equation of a Line and Graphing

2.4.2 Equation of a Line given Slope and any Point on the Line

2.4.3 Equation of a Line in Two-Point Form

2.4.4 Writing Equations in Slope Intercept or Standard Form

### **2.5 Circle**

2.5.1 Finding an Equation of a Circle and Graphing Circles

## **3. Functions and Their Graphs**

### **3.1 Functions**

3.1.1 Definition of a Function

3.1.2 Some Elementary Functions

3.1.3 Finding the Value of a Function

### **3.2 Domain, Range, and Operations on Functions**

3.2.1 Domain and Range of a Function

3.2.2 The Basic Operations on Functions

3.2.3 Composite Functions

### **3.3 Graphical Representation of a Function**

3.3.1 A Numerical Form of a Function

3.3.2 The Graph of a Function, Interpretation, Vertical Line Test

### **3.4 Techniques in Graphing and Properties of Functions**

3.4.1 Basic Functions

3.4.2 Vertical and Horizontal Translations

3.4.3 Reflection, Partial Reflection, Vertical Stretching and Shrinking

3.4.4 Symmetry, Even and Odd Functions, Averages

## **4. Linear and Quadratic Functions**

### **4.1 Graphs of Quadratic Functions**

4.1.1 Graphing A Quadratic Function

4.1.2 Maximum or Minimum Value of a Quadratic Function

## **4.2 Inequalities Involving Quadratic Functions**

4.2.1 Solve Quadratic Inequalities and Graph the Solutions

## **5. Polynomial and Rational Functions**

### **5.1 Graphs of Polynomial Functions**

5.1.1 Graphing a Polynomial Function

5.1.2 The Behavior of a Polynomial Function at Infinity

### **5.2 Asymptotes and Graphs of Rational Functions**

5.2.1 Asymptotes and Graphing Rational Functions

### **5.3 Polynomial and Rational Inequalities**

5.3.1 Solving Polynomial Inequalities

5.3.2 Solving Rational Inequalities

### **5.4 Roots of Polynomial Equations (Revisited)**

5.4.1 Real Roots

5.4.2 Complex Roots

5.4.3 Descartes Rule of Signs

5.4.4 Relations between Roots and Coefficients

## **6. Exponential and Logarithmic Functions**

### **6.1 Composite Functions and Inverse Functions**

6.1.1 Composite Functions

6.1.2 One-to-one and Inverse Functions

### **6.2 Conversions Between Exponential and Logarithmic Functions**

6.2.1 Explore Exponential Functions and their Graphs

6.2.2 Write Exponential Statements in Logarithmic Form

6.2.3 Graph Logarithmic Functions

### **6.3 The Properties of Logarithmic Functions**

6.3.1 Expand a Single/Multi-Logarithm Expression

6.3.2 Evaluate Logarithmic Expressions

### **6.4 Solving Exponential and Logarithmic Equations**

6.4.1 Solve Exponential Equations of the "Same Base" Type

6.4.2 Solve Exponential Equations "Different Bases"

6.4.3 Solve "Single/Multi-Logarithm" Equations

6.4.4 Applications for Continuous Interest and Population Growth

## **7. System of Equations**

### **7.1 Systems of Linear Equations: Substitution and Elimination**

7.1.2 Solving Linear Systems by Addition and Substitution Method

7.1.3 Applications of Linear Systems

7.1.4 Linear Equations in Three Variables

## **7.2 System of Linear Equations: Matrices**

7.2.1 The Matrix of Coefficients

7.2.2 Row Operations and The Gauss-Jordan Method

## **7.3 System of Linear Equations: Determinants**

7.3.1 The Determinant of a  $2 \times 2$ ,  $3 \times 3$  Matrix and Effects of Row Operations

7.3.2 Applications involving Determinants

## **8. Sequences**

### **8.1 Sequences**

8.1.1 Identifying patterns for the terms of a sequence

8.1.2 Sequence as a function

### **8.2 Arithmetic sequences**

8.2.1 Definition and General term of an Arithmetic Sequence/ Arithmetic Means

### **8.3 Geometric sequences**

8.3.1 Definition and General Term of a geometric sequences

8.3.2 Geometric mean(s) and Graphs

## **9. Counting and Probability**

### **9.1 Counting**

9.1.1 Principle of Counting

### **9.2 Combinatorics**

9.2.1 Permutation and Combination

### **9.3 Probability**

9.3.1 Chance and Probability