



## College Algebra Course Description

### Chapter 1: Basic Algebra (Review)

This chapter reviews many of the fundamental algebra skills that students should have mastered in Algebra 1. Students are encouraged to take the time to go over these sections to ensure they are ready for the more advance concepts later in the course.

Sections:

- Real Numbers (number operations, distributive property, simplifying algebraic expressions)
- Equations (multi-step and formulas)
- Inequalities( linear and compound)
- Absolute Value( equations and inequalities)

### Chapter 2: Graphing and Writing Linear Equations

This very important chapter stresses how to graph and write linear equations. Concepts involving the coordinate plane, slope and methods to graph lines are thoroughly reviewed and introduced. The second part of the chapter focuses on the various methods to find and write the equation of a line. Additional related topics are explored to include linear models, regression, absolute value graphs and word problems.

Sections:

- Graphing Lines with One Variable
- Graphing Lines with Two Variables
- The Slope of a Line
- Slope Intercept Method
- XY Intercept Method
- Using Slope-Intercept Form
- Using Point-Slope intercept
- Given the Slope and a Point
- Given Two Points
- Standard Form of Linear Equations
- Best Fitting Line
- Linear Models/Word Problems
- Graphing Linear Inequalities in Two Variables
- Graphing Absolute Value Equations



## College Algebra Course Description

### Chapter 3: Quadratic Equations and Complex Numbers

Understanding the properties and methods to solve quadratic equations is essential for to the student to advance in Algebra. This chapter explains each concept in a very specific and focused manner. After students have been introduced to quadratic equations they build up their knowledge by learning various techniques to solve them. Additionally, they will learn the connection between solutions and graphs of quadratic functions. Methods and procedures are applied to graph quadratic inequalities and solve word problems. Lastly the chapter covers complex and imaginary numbers. Students are introduced to complex number operations, graphs and the role complex and imaginary numbers have as solutions to equations.

Sections:

- Introduction to Quadratic Equations
- Solving Quadratic Equations by Square Roots
- Graphing Quadratic Equations
- The Quadratic Formula
- Solving Quadratic Equations by Factoring
- The Discriminant - Types of Roots
- Completing The Square
- Quadratic Equation Word Problems
- Graphing Quadratic Inequalities
- Complex and Imaginary Numbers

### Chapter 4: Functions and Relations

Functions and relations transcend all through mathematics. This chapter explains core concepts at the Algebra level and prepares the student for more advance study of the topic. Time is taken to explain the difference between a function and relation and introduce the student to the language of functions to include the domain, range and linear/nonlinear functions. Students will also learn function operations, composite functions and graphing.

Sections:

- Introduction to Functions and Relations
- Function Operations
- Inverse Functions
- Graphing Functions
- Linear and Nonlinear Functions
- Special Functions
- Composite Functions



## College Algebra Course Description

### Chapter 5: Systems

Understanding systems and the methods to solve them are vital in Algebra. This chapter introduces/reviews techniques to solve linear systems. Students will also explore special systems, word problems and systems of linear inequalities. Lastly, the topic of Linear Programming will be introduced. This powerful technique uses systems to “optimize” a constrain function. Because Linear Programming is widely used in business and industry this part of the chapter is a nice way to connect concepts of systems to “real world” applications.

Sections:

- Solving Systems by Graphing
- Solving Systems Substitution Method
- Solving Systems by Elimination/Linear Combination
- Solving Linear System Word Problems
- Special Linear Systems
- Solving Systems of Linear Inequalities
- Linear Programming/Word Problems

### Chapter 6: Matrices and Determinants

This chapter introduces the core concepts of matrices and determinants to students. Time is taken to teach terminology and common applications of matrices. Students will learn how to perform various matrix operations to include matrix addition, subtraction multiplication and scalar multiplication. Additionally students will learn the steps to find determinants and inverse of a matrix. The chapter also focuses on how matrices can be used to solve linear systems by using an inverse matrix or Cramer’s Rule.

Sections:

- Introduction to Matrices
- Matrix Operations
- Matrix Multiplication
- Determinants
- Identity and Inverse Matrices
- Solving Systems using Inverse Matrices
- Solving Systems using Cramer’s Rule



## College Algebra Course Description

### Chapter 7: Polynomial Functions

The first part of the chapter covers the parts of a polynomial, related terminology and how to perform polynomial operations. A special focus is placed on the extremely important skill of factoring polynomials. Students will understand how to factor out a polynomial GCF and build on this to learn many techniques to factor polynomials. Lastly, the chapter goes into the various methods and techniques to solve a polynomial of any degree. Students will specifically learn how to apply key concepts, skills (polynomial long and synthetic division) and theorems (Rational Root and Fundamental Theorem of Algebra) to find the roots of polynomial functions.

Sections:

- Introduction to Polynomials
- Adding and Subtracting Polynomials
- Multiplying Polynomials
- Multiplying Polynomials Special Cases
- Sum and Difference of Two Cubes
- Factoring Greatest Common Factor
- Factoring Quadratic Trinomials
- Special Factoring Rules
- Graphing Polynomials
- Polynomial Division( long and synthetic division)
- Remainder and Factor Theorem
- Rational Root Theorem( Rational-Zero Test)
- Solving Polynomial Equations by Factoring
- Solving n-degree Polynomials( Fundamental Theorem of Algebra)



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### Chapter 8: Rational Expressions/Equations

The first part of the chapter takes the student through fundamental rational expressions to include ratios, rates, proportions, percent and variation. Special emphasis is placed on learning different methods to solve rational expression problems. The section on simplifying rational algebraic expressions starts by reviewing basic examples using numbers before introducing variable examples. The second part of the chapter builds from the student's knowledge of polynomials and covers operations with rational expressions. Instruction will focus on learning to multiply, divide, find the LCD and solve rational expressions. Also a section is dedicated to the procedure/ methods to graph rational functions; new terms like vertical and horizontal asymptotes will be explained.

Sections:

- Ratios and Proportions
- Percent
- Direct and Inverse Variation
- Simplifying Rational Expressions
- Multiplying and Dividing Rational Expressions
- Finding the LCD of Rational Expressions
- Solving Rational Equations
- Adding and Subtracting Rational Expressions
- Operations and Equations with Rational Exponents
- Graphing Rational Functions( vertical and horizontal asymptotes)

### Chapter 9: Powers and Radicals

This chapter covers all the rules the student will need to work with powers, exponents, radicals and rational exponents. Also, important applications of these rules are covered to include scientific notation, compound interest, Pythagorean Theorem and the Distance and Mid-Point formula. Special emphasis is placed on solving radical and rational root equations.

Sections:

- Product and Power Rules of Exponents
- Negative and Zero Exponents Rules
- Division Rules of Exponents
- Scientific Notation
- Compound Interest
- Simplifying Radicals
- Operations with Radicals
- Solving Radical Equations
- Operations and Equations with Rational Exponents
- The Distance and Mid-Point Formula
- The Pythagorean Theorem



## College Algebra Course Description

### Chapter 10: Logarithmic and Exponential Functions

For most students this chapter will be their first introduction to logarithms. As such the chapter focuses on teaching the basic core concepts of a logarithm and its relationship to an exponential function. Students will learn how to convert between a logarithm/exponential equation. Additionally, the chapter defines the properties of logarithms and how to condense and expand logarithmic expressions. The Natural Base  $e$  and Natural logarithms are explored with explanations of how to use the “log and ln” functions on a scientific calculator. Finally the chapter covers the methods and procedure to solve exponential and logarithmic equations.

Sections:

- Exponential Growth and Decay Functions
- Introduction to Logarithms
- Properties of Logarithms
- The Natural Base  $e$
- Natural Logarithms
- Solving Logarithmic Equations
- Solving Exponential Equations