



# College Algebra with Corequisite Support: A Compressed Approach

978-1-63545-059-0



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Alta College Algebra with Corequisite Support: A Compressed Approach is a one-semester course that employs an early review/scaffolding period in the first several weeks of the course to prepare enrolled students for the college-level College Algebra work ahead. In this course, students will spend the first 3-5 weeks working on developmental-level or preparatory content, before moving on to college-level work for the balance of the semester.

To develop the course, Knewton used four main sources of content: Openstax, videos created by a Math Professor we have partnered with, the Open Textbook Library, and a team of Subject Matter Experts (SMEs). The SMEs come from diverse backgrounds and are all accomplished academics in the field of mathematics.

Alta College Algebra with Corequisite Support: A Compressed Approach has two instructional sequences for every learning objective, giving students multiple opportunities to learn new concepts. Alta College Algebra with Corequisite Support: A Compressed Approach covers the typical breadth of college algebra topics, and also provides the necessary depth to ensure the course is manageable and engaging for instructors and students alike.

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- Applications of Systems of Linear Equations
  - Use systems of equations to investigate profits
  - Write and solve a system of equations in two variables from a word problem
- Linear Inequalities in Two Variables
  - Solve a linear inequality in two variables by graphing
  - Solve a linear system of inequalities by graphing

#### 13.2 Systems of Linear Equations in Three Variables

- Systems of Linear Equations in Three Variables
  - Determine whether an ordered triple is a solution to a system
  - Solve systems of three equations in three variables
  - Identify inconsistent and dependent systems of equations containing three variables, and express the solution of a system of dependent equations

#### 13.3 Systems of Nonlinear Equations in Two Variables

- Systems of Two Nonlinear Equations
    - Solve a system of nonlinear equations representing a parabola and a line
    - Solve a system of nonlinear equations representing a circle and a line
    - Solve a system of nonlinear equations in two variables using elimination
  - Graphing Nonlinear Inequalities and Systems of Inequalities
    - Graph a nonlinear inequality
    - Graph a system of nonlinear inequalities
-

### 13.4 Partial Fractions

- Partial Fraction Decomposition with Linear Factors
  - Decompose a rational expression where the denominator has only nonrepeated linear factors
  - Decompose a rational expression where the denominator has repeated linear factors
- Partial Fraction Decomposition with Quadratic Factors
  - Decompose a rational expression where the denominator has a nonrepeated irreducible quadratic factor
  - Decompose a rational expression where the denominator has a repeated irreducible quadratic factor

### 13.5 Matrices and Matrix Operations

- Introduction to Matrices
  - Determine the order of a matrix and describe elements within a matrix
  - Add or subtract matrices
- Matrix Multiplication
  - Multiply a matrix by a scalar
  - Find the sum or difference of scalar multiples
  - Multiply two matrices

### 13.6 Augmented Matrices and Gaussian Elimination

- Solving Systems with Gaussian Eliminations
  - Convert between a system of equations and its corresponding augmented matrix
  - Use row operations to solve a system of linear equations in two variables
  - Use row operations to solve a system of linear equations in three variables
  - Use matrices to solve applications of systems of linear equations

### 13.7 Determinants of Matrices and the Inverse Matrix

- Finding Determinants of Matrices
  - Find the determinant of a 2x2 matrix
  - Find the determinant of a 3x3 matrix
- Inverse and Identity Matrices
  - Understand the identity matrix and how it relates to the inverse matrix
  - Determine if a matrix is invertible using the determinant
  - Find the inverse of a 2x2 matrix
  - Find the inverse of a 3x3 matrix
- Solving Systems with Inverses
  - Solve a system of linear equations using the inverse of a 2x2 matrix
  - Solve a system of linear equations using the inverse of a 3x3 matrix

### 13.8 Cramer's Rule

- Solving Systems with Cramer's Rule
    - Use Cramer's rule to solve a system of two equations in two variables
    - Use Cramer's rule to solve a system of three equations in three variables
    - Use Cramer's rule to solve inconsistent or dependent systems
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## Chapter 14: Conic Sections

### 14.1 Ellipses

- Ellipses Centered at the Origin
  - Identify key points and axes of ellipses from a graph
  - Identify key points and axes of ellipses from an equation
  - Write the equation in standard form of an ellipse centered at the origin
  - Graph an ellipse centered at the origin from an equation in standard form
- Ellipses Not Centered at the Origin
  - Identify key points and axes of ellipses not centered at the origin
  - Write the equation in standard form of an ellipse not centered at the origin
  - Graph an ellipse not centered at the origin
- Ellipses Not in Standard Form and Applications of Ellipses
  - Convert an equation of an ellipse into standard form
  - Graph an ellipse where the equation is not given in standard form
  - Use ellipses in applications

### 14.2 Hyperbolas

- Hyperbolas Centered at the Origin
  - Locate the vertices and foci of a hyperbola from a graph
  - Identify vertices, foci, and asymptotes of a hyperbola from an equation
  - Write the equation of a hyperbola centered at the origin in standard form
  - Graph a hyperbola centered at the origin from an equation in standard form
- Hyperbolas Not Centered at the Origin
  - Identify vertices, foci, and asymptotes of a hyperbola not centered at the origin
  - Write the equation of a hyperbola not centered at the origin
  - Graph a hyperbola not centered at the origin from an equation in standard form
- Hyperbolas Not in Standard Form and Applications of Hyperbolas
  - Convert an equation of a hyperbola into standard form
  - Graph a hyperbola from an equation given in general form
  - Use hyperbolas in applications

### 14.3 Parabolas

- Parabolas Centered at the Origin
    - Identify key components of a parabola from a graph
    - Identify key components of a parabola from an equation
    - Graph a parabola centered at the origin
    - Write the equation of a parabola centered at the origin in standard form
  - Parabolas Not Centered at the Origin
    - Identify key components of a parabola not centered at the origin
    - Graph a parabola not centered at the origin
    - Write the equation of a parabola not centered at the origin in standard form
  - Parabolas Not in Standard Form and Applications of Parabolas
    - Convert an equation of a parabola into standard form
    - Graph a parabola from an equation given in general form
    - Use parabolas in applications
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## Chapter 15: Sequences, Series, and Basic Probability

### 15.1 Sequences

- Introduction to Sequences
  - Write the terms of a sequence defined by an explicit formula
  - Write the terms of a sequence defined by a piecewise explicit formula
- Recursive Sequences
  - Write the terms of a sequence defined by a recursive formula
  - Write the terms of a sequence defined by a recursive formula with more than one initial term

### 15.2 Arithmetic Sequences

- Arithmetic Sequences
  - Find the common difference of an arithmetic sequence
  - Write terms of an arithmetic sequence
  - Write a recursive formula for an arithmetic sequence
  - Write an explicit formula for an arithmetic sequence
- Applications of Arithmetic Sequences
  - Find specific terms of an arithmetic sequence given other terms
  - Solve application problems with arithmetic sequences

### 15.3 Geometric Sequences

- Geometric Sequences
  - Find the common ratio of a geometric sequence
  - Write terms of a geometric sequence
  - Write a recursive formula for a geometric sequence
  - Write an explicit formula for a geometric sequence
- Applications of Geometric Sequences
  - Write an explicit formula for the  $n$ th term of a sequence
  - Solve application problems with geometric sequences
  - Solve geometric sequence problems

### 15.4 Series

- Summation Notation and Arithmetic Series
    - Evaluate expressions using summation notation
    - Find the sum of a finite arithmetic series
  - Finite and Infinite Geometric Series
    - Find the sum of a finite geometric series
    - Determine if the sum of an infinite series is defined
    - Find the sum of an infinite geometric series
  - Applications of Series
    - Solve application problems with arithmetic series
    - Solve application problems with geometric series
    - Find the equivalent fraction for a repeating decimal
    - Solve an annuity problem
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### 15.5 Counting Theory

- The Addition and Multiplication Principles
  - Solve counting problems using the addition principle
  - Solve counting problems using the multiplication principle
  - Evaluate an expression with factorials
- Permutations
  - Find the number of permutations of  $n$  distinct objects using the multiplication principle
  - Find the number of permutations of  $n$  distinct objects using a formula
  - Find the number of permutations of  $n$  non-distinct objects
- Combinations
  - Find the number of combinations using the formula
  - Find the number of subsets of a set

### 15.6 Binomial Theorem

- Binomial Expansion
  - Find a binomial coefficient
  - Expand a binomial using the binomial theorem
  - Use the binomial theorem to find a single term

### 15.7 Probability

- Basic Probability
    - Compute the probability of equally likely outcomes
    - Compute the probability of the union of two events
    - Use the complement rule to compute probabilities
    - Compute probability using counting theory
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