

College Algebra **4-5 semester hours**

**Prerequisites: Geometry and Intermediate Algebra
both with a grade of “C” or better**

Note: See Technology Statement in the Introduction

College Algebra strengthens and expands algebraic and function concepts from intermediate algebra, covering any overlapping material at a deeper level. The course develops the concept of a function and its graph, inverse functions, exponential and logarithmic functions and their applications, and the theory of equations. Additional topics may include: conic sections, systems of equations, matrices, sequences and series, mathematical induction, the binomial theorem, permutations and combinations, and/or probability.

Course Content

The specified topics below are required for the course. At least two but no more than four of the further topics are to be included; institutions should consider subsequent courses in the curriculum when determining these further topics.

I. Specified Topics

A. Functions and Graphs

1. Aspects of Graphs
 - a. Intercepts
 - b. Symmetry
 - c. Transformations
 - d. Increase and Decrease
2. Aspects of Functions
 - a. Definition
 - b. Domain and Range
 - c. Inverse Functions
 - d. Basic Graphs
 - e. Combinations and Composition of Functions
3. Specific Functions to be Studied
 - a. Polynomial
 - b. Rational
 - c. Exponential
 - d. Logarithmic (to include properties of logarithms and solving logarithmic equations)

B. Theory of Equations

1. Polynomial Division (synthetic and/or long division)
2. Factor and Root Theorems

II. Further Topics

- A. Conic Sections
 - 1. Algebraic Representation of the Parabola, Circle, Ellipse, and Hyperbola
 - 2. Graphs of Conic Sections
 - 3. Properties and Terminology of Conic Sections (optional)
- B. Systems of Equations
 - 1. Systems of Linear Equations
 - 2. Systems of Non-Linear Equations
 - 3. Systems of Linear Inequalities (optional)
- C. Systems of Equations and Matrices
 - 1. Matrix Solutions to Linear Systems
 - 2. Matrix Operations and Applications (optional)
 - 3. Determinants (optional)
- D. Sequences and Series
 - 1. Introduction and Notation (to include sigma notation)
 - 2. Arithmetic and Geometric Sequences and Series (optional)
- E. Mathematical Induction
- F. Binomial Theorem
- G. Counting Methods, Permutations, and Combinations
- H. Probability Theory

Course Objectives—The student will be able to:

1. Demonstrate an understanding of function graphs, their transformations, and their properties.
2. Identify the domain and range of a function, recognize when an inverse function exists, and form the inverse when possible.
3. Graph quadratic, polynomial, rational, exponential, and logarithmic functions and demonstrate, through application to real-world situations, knowledge of the properties of these functions.
4. Use appropriate theorems and techniques to locate the roots of second and higher degree polynomial equations.
5. Apply the algebraic and graphing techniques learned in this course to solve applications encountered in subsequent math courses.
6. Apply technology appropriately in problem solving and in exploring and developing mathematical concepts.

Trigonometry

2-3 semester hours

Prerequisites: Geometry and Intermediate Algebra both with a grade of “C” or better

Note: See Technology Statement in the Introduction

Trigonometry develops the definitions, properties, and graphical characteristics of trigonometric functions. Included in this course are: radian measure, trigonometric identities and equations, solutions of oblique and right triangles, and inverse trigonometric functions. Additional topics may include: an introduction to polar coordinates, the complex plane and polar form, powers and roots of complex numbers, and vectors.

Course Content

The specified topics below are required for the course. At most two of the further topics may be included; institutions should consider subsequent courses in the curriculum and the credit hours allotted to the Trigonometry course when determining these further topics.

I. Specified Topics

- A. Definitions and Properties of the Basic Trigonometric Functions
- B. Radian Measure
 - 1. Conversion between Degrees and Radians
 - 2. Arc Length, Sector Area, Linear and Angular Velocity (optional)
- C. Graphs of Basic Trigonometric Functions
 - 1. Sine and Cosine Graph Transformations
 - 2. Graph Transformations for Other Trigonometric Functions (optional)
- D. Trigonometric Identities
 - 1. Ratio, Reciprocal, and Pythagorean Identities
 - 2. Sum, Difference, and Double-Angle Identities
 - 3. Half-Angle and Power-Reducing Identities
 - 4. Sum-Product Identities (optional)
 - 5. Verifying Trigonometric Identities
- E. Solving Trigonometric Equations
- F. Solving Triangles
 - 1. Solving Right Triangles
 - 2. Solving Oblique Triangles (Law of Sines and Law of Cosines)
- G. Inverse Trigonometric Functions
 - 1. Graphs
 - 2. Applications

II. Further Topics

- A. Introduction to Polar Coordinates
 - 1. Plotting Points Using Polar Coordinates
 - 2. Converting Between Polar and Cartesian Coordinates
- B. The Complex Plane and Polar Form
- C. Powers and Roots of Complex Numbers (DeMoivre’s Theorem)
- D. Introduction to Vectors

Course Objectives—The student will be able to:

- 1. Define and evaluate any trigonometric function at any angle given an input in radian or degree measure.
- 2. Graph any of the six trigonometric functions as well as transformations of sine and cosine graphs.
- 3. Apply basic trigonometric identities to verify new identities and transform trigonometric expressions.

4. Find all solutions (and solutions in a specified domain) for a trigonometric equation.
5. Solve right or oblique triangles, applying the Law of Sines and the Law of Cosines as needed.
6. Apply inverse trigonometric functions as appropriate and graph inverse trigonometric functions.

College Algebra & Trigonometry 5-6 semester hours Prerequisites: Geometry and Intermediate Algebra both with a grade of “C” or better

Note: See Technology Statement in the Introduction

This is an integrated course covering topics from College Algebra and Trigonometry. Specifically, the course develops the concept of a function and its graph, inverse functions, exponential and logarithmic functions and their applications, and the theory of equations. It also develops the definitions, properties, and graphical characteristics of trigonometric functions. Included are radian measure, trigonometric identities and equations, solutions of oblique and right triangles, and inverse trigonometric functions.

Course Content

The specified topics below are required for the course. Due to time constraints, it is recommended that no more than one further topic from those listed for College Algebra or Trigonometry be included in this integrated course.

I. Specified Topics in College Algebra

- A. Functions and Graphs
 1. Aspects of Graphs
 - e. Intercepts
 - f. Symmetry
 - g. Transformations
 - h. Increase and Decrease
 2. Aspects of Functions
 - f. Definition
 - g. Domain and Range
 - h. Inverse Functions
 - i. Basic Graphs
 - j. Combinations and Composition of Functions
 3. Specific Functions to be Studied
 - e. Polynomial
 - f. Rational
 - g. Exponential
 - h. Logarithmic (to include properties of logarithms and solving logarithmic equations)
- B. Theory of Equations
 1. Polynomial Division (synthetic and/or long division)
 2. Factor and Root Theorems

II. Specified Topics in Trigonometry

- A. Definitions and Properties of the Basic Trigonometric Functions
- B. Radian Measure
 1. Conversion between Degrees and Radians
 2. Arc Length, Sector Area, Linear and Angular Velocity (optional)
- C. Graphs of Basic Trigonometric Functions

1. Sine and Cosine Graph Transformations
2. Graph Transformations for Other Trigonometric Functions (optional)
- D. Trigonometric Identities
 1. Ratio, Reciprocal, and Pythagorean Identities
 2. Sum, Difference, and Double-Angle Identities
 3. Half-Angle and Power-Reducing Identities
 4. Sum-Product Identities (optional)
 5. Verifying Trigonometric Identities
- E. Solving Trigonometric Equations
- F. Solving Triangles
 1. Solving Right Triangles
 2. Solving Oblique Triangles (Law of Sines and Law of Cosines)
- G. Inverse Trigonometric Functions
 1. Graphs
 2. Applications

III. Further Topics

- A. Conic Sections
- B. Systems of Equations
- C. Systems of Equations and Matrices
- D. Sequences and Series
- E. Mathematical Induction
- F. Binomial Theorem
- G. Counting Methods, Permutations, and Combinations
- H. Probability Theory
- I. Introduction to Polar Coordinates
- J. The Complex Plane and Polar Form
- K. Powers and Roots of Complex Numbers (DeMoivre's Theorem)
- L. Introduction to Vectors

Course Objectives—The student will be able to:

1. Demonstrate an understanding of function graphs, their transformations, and their properties.
2. Identify the domain and range of a function, recognize when an inverse function exists, and form the inverse when possible.
3. Graph quadratic, polynomial, rational, exponential, and logarithmic functions and demonstrate, through application to real-world situations, knowledge of the properties of these functions.
4. Use appropriate theorems and techniques to locate the roots of second and higher degree polynomial equations.
7. Define and evaluate any trigonometric function at any angle given an input in radian or degree measure.
8. Graph any of the six trigonometric functions as well as transformations of sine and cosine graphs.
9. Apply basic trigonometric identities to verify new identities and transform trigonometric expressions.
10. Find all solutions (and solutions in a specified domain) for a trigonometric equation.
11. Solve right or oblique triangles, applying the Law of Sines and the Law of Cosines as needed.
12. Apply inverse trigonometric functions as appropriate and graph inverse trigonometric functions.
13. Apply the algebraic, trigonometric, and graphing principles learned in this course to solve applications encountered in subsequent math courses.
14. Apply technology appropriately in problem solving and in exploring and developing mathematical concepts.