

Phoenix Christian Sr High School

MTH300 Advanced Algebra

Course Scope & Sequence

COURSE DESCRIPTION

Goal of the Mathematics Program: Provide students with a well-rounded base of mathematical knowledge that they will be able to apply in a variety of contexts. Underscore the hand of God in the creation through mathematics.

Advanced Algebra Objective: Build on algebraic skills established in Algebra I through the study of polynomials, matrices and advanced graphing techniques.

National Conference of Teachers of Mathematics (NCTM) Standards: The NCTM Standards are referenced at the end of each quarter.

REQUIRED TEXTS AND *KEY SUPPLEMENTAL MATERIALS

Advanced Algebra for a Changing World, Prentice Hall
TI-83 Plus Graphing Calculator (required)

COURSE SCOPE AND SEQUENCE

First Quarter

Algebra Skills Review 2 Weeks

Key Concepts: Integers and Formulas, Coordinates, Slope and Solving Equations, Absolute Value Equations, Two Variable Equations and Inequalities, Exponents and Radicals, Polynomials and Factoring, Pythagorean Theorem, Rational Expressions.
Assessments: 4 Weekly Homework Assignments, 2 Weekly Quizzes, 1 Chapter Test, 2 Applications Projects.

Models, Functions and Permutations 3 Weeks

Key Concepts: Collecting and Organizing Data, The Slope of a Line, Graphical Models, Finding a Line of Best Fit, Relations and Functions, Composite Functions, Working with Functions, Vertical and Horizontal Equations, Counting Methods and Permutations, Real Numbers, Evaluating Expressions
Assessments: 4 Weekly Homework Assignments, 2 Weekly Quizzes, 1 Chapter Test, 2 Applications Projects.

Linear Relationships and Functions 4 Weeks

Key Concepts: Linear Equations and Slope, Graphing Linear Equations, Direct Variation, Interpreting Linear Functions, Applications of Linear Functions, Piecewise Functions, One Variable Equations and Inequalities, Two Variable Equations and Inequalities, Exploring Probability
Assessments: 4 Weekly Homework Assignments, 2 Weekly Quizzes, 1 Chapter Test, 2 Applications Projects.

NCTM Standards: Judge the effects of such operations as multiplication, division, and computing powers and roots on the magnitudes of quantities; develop an understanding of permutations and combinations as counting techniques; formulate questions that can be addressed with data and collect, organize, and display relevant data to answer them.

Biblical Integration: The rules of logic applied as a tool in apologetics. Mathematics within the Christian world view contrasted with mathematics within the naturalistic world view.

Second Quarter

Matrices 3 Weeks

Key Concepts: Organizing Data into Matrices, Entering Matrices in the Calculator, Adding and Subtracting Matrices, Scalar Matrix Multiplication, Multiplying Two Matrices, Geometric Transformations, Geometric Transformations with Matrices, Networks, Determinants, Identity and Inverse Matrices, Solving Matrix Equations.
Assessments: 4 Weekly Homework Assignments, 2 Weekly Quizzes, 1 Chapter Test, 2 Applications Projects.

Linear Systems 2 Weeks

Key Concepts: Graphing Systems of Equations, Graphing Systems of Inequalities, Solving Systems by Substitution, Solving Systems by Elimination, Linear Programming, Graphs in Three Dimensions, Systems with Three Variables, Applications of Systems of Equations, Cramer's Rule.
Assessments: 4 Weekly Homework Assignments, 2 Weekly Quizzes, 1 Chapter Test, 2 Applications Projects.

Quadratic Equations and Functions 4 Weeks

Key Concepts: Modeling Data with Quadratic Equations, Properties of Parabolas, Comparing Vertex and Standard Forms of Parabolas, Finding Intercepts, Inverse Functions, Square Root Functions, Factoring Quadratic Equations, Solving Quadratic Equations, Complex Numbers, Completing the Square, Finding Vertex Form by Completing the Square, The Quadratic Formula.
Assessments: 4 Weekly Homework Assignments, 2 Weekly Quizzes, 1 Chapter Test, 2 Applications Projects.

NCTM Standards: Develop an understanding of properties of, and representations for, the addition and multiplication of vectors and matrices; compare and contrast the properties of numbers and number systems, including the rational and real numbers, and understand complex numbers as solutions to quadratic equations that do not have real solutions; write equivalent forms of equations, inequalities, and systems of equations and solve them with fluency—mentally or with paper and pencil in simple cases and using technology in all cases.

Biblical Integration: Proof by contradiction (Mark 3:22-26). God as the source of truth that mathematicians discover, but do not create. Laws of probability can only exist within a theistic universe.

Third Quarter

Polynomials and Polynomial Functions 3 Weeks

Key Concepts: Properties of Exponents, Power Functions and their Inverses, Polynomial Functions, Polynomial and Linear Factors, Solving Polynomial Equations, Long Division of Polynomials, Synthetic Division, Combinations, Pascal's Triangle, The Binomial Theorem.

Assessments: 4 Weekly Homework Assignments, 2 Weekly Quizzes, 1 Chapter Test, 2 Applications Projects.

Exponential and Logarithmic Functions 3 Weeks

Key Concepts: Exponential Functions, Exploring Exponential Models, Fitting Exponential Curves to Data, Applications of Exponential Functions, Logarithmic Functions as Inverses, Properties of Logarithms, Solving Exponential Equations, Solving Logarithmic Equations, Natural Logarithms.

Assessments: 4 Weekly Homework Assignments, 2 Weekly Quizzes, 1 Chapter Test, 2 Applications Projects.

Rational Functions 3 Weeks

Key Concepts: Exploring Inverse Variation, Graphing Rational Functions, Graphing Inverse Variations, Analyzing Graphs of Rational Functions, Rational Expressions, Adding and Subtracting Rational Expressions, Solving Rational Equations, Applications of Rational Functions.

Assessments: 4 Weekly Homework Assignments, 2 Weekly Quizzes, 1 Chapter Test, 2 Applications Projects.

NCTM Standards: Understand and compare the properties of classes of functions, including exponential, polynomial, rational, logarithmic, and periodic functions; understand and perform transformations such as arithmetically combining, composing, and inverting commonly used functions, using technology to perform such operations on more-complicated symbolic expressions; identify essential quantitative relationships in a situation and determine the class or classes of functions that might model the relationships.

Biblical Integration: Pascal's wager, The immutability of God. Absolutes, mathematical and moral. The infinite nature of God (demonstrated by a line) contrasted with the everlasting nature of man (demonstrated by a ray).

Fourth Quarter

Quadratic Relations 3 Weeks

Key Concepts: Exploring Conic Sections, Graphing Relations, Parabolas, Circles, Ellipses, Hyperbolas, Translating Conic Sections, Completing the Square to Identify Conics, Nonlinear Systems.

Assessments: 4 Weekly Homework Assignments, 2 Weekly Quizzes, 1 Chapter Test, 2 Applications Projects.

Periodic Functions and Trigonometry 4 Weeks

Key Concepts: Exploring Periodic Data, Positions on the Unit Circle, Trigonometry with the Unit Circle, Radian Measure, Arc Length, The Sine Function, The Cosine Function, The Tangent Function, Right Triangles and Trigonometric Ratios, Inverse Trigonometric Functions, The Law of Sines, The Law of Cosines, Applications of the Laws of Sines and Cosines.

Assessments: 4 Weekly Homework Assignments, 2 Weekly Quizzes, 1 Chapter Test, 2 Applications Projects.

Additional Topics in Trigonometry and Advanced Algebra 2 Weeks

Key Concepts: Translating Trigonometric Functions, Reciprocal Trigonometric Functions, Trigonometric Identities, Trigonometric Equations, Applying Trigonometric Identities, The Remainder Theorem, The Rational Root Theorem.

Assessments: 4 Weekly Homework Assignments, 2 Weekly Quizzes, 1 Chapter Test, 2 Applications Projects.

NCTM Standards: Identify essential quantitative relationships in a situation and determine the class or classes of functions that might model the relationships; recognize reasoning and proof as fundamental aspects of mathematics; investigate conjectures and solve problems involving two- and three-dimensional objects represented with Cartesian coordinates.

Biblical Integration: Evidence of intelligent design in mathematics and within all of creation itself; including order (1 Corinthians 14:33, Psalm 147:4), and consistency (Hebrews 13:8, Malachi 3:6).