Honors Algebra II

COURSE DESCRIPTION: This course builds upon algebraic concepts covered in Algebra I and prepares students for advanced-level courses. Students extend their knowledge and understanding by solving open-ended problems and thinking critically. Topics include functions and their graphs, quadratic functions, inverse functions, advanced polynomial functions, and conic sections. Students are introduced to rational, radical, exponential, and logarithmic functions; sequences and series; data analysis; and matrices.

This course includes all the topics in MTH303, but has more challenging assignments and includes more optional challenge activities. Each semester also includes an independent honors project. This course requires the use of a graphing calculator equivalent to a TI-84 and includes tutorials and activities for using a handheld graphing calculator.

PREREQUISITES: Successful completion of Algebra I and Geometry

COURSE LENGTH: Two Semesters

REQUIRED TEXT: Algebra II: A Reference Guide and Problem Sets

MATERIALS LIST: TI-84 graphing calculator

COURSE OUTLINE:

Semester 1

Unit 1: Numbers, Expressions, and Equations

- Semester Introduction
- Sets of Number
- Number Lines and Absolute Value
- Number Properties
- Evaluating Expressions
- Solving Equations
- Solving Absolute Value Equations
- Applications: Formulas

Unit 2: Linear Equations and Systems

- Graphs of Lines
- Forms of Linear Equations
- Writing Equations of Lines
- Applications: Linear Equations
- Systems of Linear Equations, Part 1
- Systems of Linear Equations, Part 2
- Applications: Linear Systems

Unit 3: Functions
- Function Basics
- Function Equations
- Absolute Value Functions
- Piecewise Functions
- Step Functions
- Function Operations, Part 1
- Function Operations, Part 2
- Function Inverses

Unit 4: Inequalities
- Inequalities in One Variable
- Compound Inequalities
- Absolute Value Inequalities
- Inequalities in Two Variables
- Systems of Linear Inequalities
- Linear Programming

Unit 5: Polynomials and Power Functions
- Working with Polynomials
- Multiplying Polynomials
- Factoring Patterns
- More Factoring Patterns
- Solving Polynomial Equations
- Power Functions

Unit 6: Rational Equations

- Dividing Monomials and Polynomials
- Operations with Rational Expressions, Part 1
- Operations with Rational Expressions, Part 2
- Compound Fractions
- Solving Rational Equations, Part 1
- Solving Rational Equations, Part 2
- Reciprocal Power Functions
- Graphing Rational Functions

Unit 7: Radicals and Complex Numbers

- Simplifying Radical Expressions
- Fractional Exponents and Higher Roots
- Graphing Radical Functions
- Solving Radical Equations
- Imaginary Numbers
- Complex Numbers
- Multiplying and Dividing Complex Numbers
- Solving Equations with Complex Solutions

Unit 8: Quadratic Functions

- Graphing Quadratic Functions
- Properties of Quadratic Functions
- Solving Quadratic Equations, Part 1
- Solving Quadratic Equations, Part 2
- Quadratic Inequalities
- Finding a Quadratic from Points
- Applications: Quadratic Functions

Unit 9: Semester Review and Test

- Semester Review
- Semester Test

Semester 2

Unit 1: Solving and Graphing Polynomials

- Semester Introduction
- Polynomial Long Division
- Synthetic Division
- The Polynomial Remainder Theorem
- Factors and Rational Roots
- Graphing Polynomials
- Factoring Polynomials Completely
- Applications: Polynomials

Unit 2: Exponents and Logarithms

- Exponential Expressions and Equations, Part 1
- Exponential Expressions and Equations, Part 2
- Graphing Exponential Functions
- Applications: Growth and Decay
- Logarithms
- Using Logs to Solve Exponential Equations
- Solving Logarithmic Equations
- Graphing Logarithmic Functions
- Applications: Logarithms

Unit 3: Sequences and Series

- Sequences and Patterns
- Arithmetic Sequences
- Geometric Sequences
- Applications: Sequences
- Series and Sigma Notation
- Arithmetic Series
- Geometric Series
- Applications: Series
- Technology: Sequences and Series

Unit 4: Counting and Probability

- Counting Principles
- Permutations and Factorials

- Combinations
- Basic Probability
- Probability With and Without Replacement
- Independent and Dependent Events
- Mutually Exclusive Events
- Binomial probability
- Making Predictions

Unit 5: Statistics
- Measures of Center
- Variability
- Samples
- Graphs of Univariate Data
- Frequency Distributions
- The Normal Distribution
- Lines of Best Fit

Unit 6: Vectors and Matrices
- Matrices and Vectors
- Operations with Matrices
- Matrix Multiplication
- Transforming Points and Figures
- Determinants and Cramer's Rule, Part 1
- Determinants and Cramer's Rule, Part 2
- Identity and Inverse Matrices
- Using Matrices to Solve Linear Systems

Unit 7: Conic Sections
- Introduction to Conic Sections
- Circles
- Ellipses
- Hyperbolas
- Parabolas
- Putting Conics into Graphing Form, Part 1

- Putting Conics into Graphing Form, Part 2

Unit 8: Semester Review and Test
- Semester Review
- Semester Test