

The Department's Educational Philosophy

The study of mathematics will enhance the ability of all students to problem solve and to reason. Through a strong standardized departmental program that emphasizes problem solving, communicating, reasoning and proof, making connections, and using representations, students will develop self-confidence and a positive attitude towards mathematics.

Our curriculum matches that of the Massachusetts Mathematics Curriculum Framework, and we are philosophically aligned with the National Council of Teachers of Mathematics Standards.

Guiding Principles

- Mathematical ideas should be explored in ways that stimulate curiosity, create enjoyment of mathematics, and develop depth of understanding.
- Effective mathematics programs focus on problem solving and require teachers who have a deep knowledge of the discipline.
- Technology is an essential tool in a mathematics education, and all students should gain facility in using it where advantageous.
- All students should have a high-quality mathematics program.
- Assessment of student learning in mathematics should take many forms to inform instruction and learning.
- All students should understand the basic structure of mathematics.
- All students should recognize that the techniques of mathematics are reflections of its theory and structure.
- All students should gain facility in applying mathematical skills and concepts.
- All students should understand the role of inductive and deductive reasoning in mathematic and real life situations.

ALGEBRA II (H): COURSE #321

Course Frequency: Full-year course, five times per week

Credits Offered: Five

Prerequisites: A final grade of at least 70 in both Algebra I and Geometry

Background to the Curriculum

This course uses the Houghton Mifflin text by Dolciani et.al., Algebra 2 and Trigonometry, 1992 edition. It is the third course in our honors (H) program, and the majority of the students enrolled have taken Algebra I H and Geometry H. This specific text has been used since 1992; however, this course has used older editions of this same text since the late 1960s. The text is followed quite closely, although the material on Trigonometry and Probability/Statistics is not covered. The text matches the 2000 edition of the Massachusetts State Framework recommendations for a second-year Algebra course and is philosophically aligned with the spirit of the National Council of Teachers of Mathematics curriculum standards. Teachers bring in other material where appropriate and may make minor changes as to emphasis on certain topics after consultation with the RDL.

Core Topics/Questions/Concepts/Skills

Solving equations and inequalities in one variable

Working with linear relations and functions

Solving systems of linear equations and inequalities

Simplifying polynomial and radical expressions

Analyzing and graphing quadratic relations and functions

The algebra of rational expressions and rational/fractional equations

Exponential and Logarithmic Functions

Theory of Polynomial Equations

Using sequences and series

Matrix Operations

Permutations, Combination, and Probability

Course-End Learning Objectives

Students will be able to:

- 1] Solve Linear equations and inequalities, including those with absolute values.
- 2] Graph linear equations and inequalities.
- 3] Find the equation of a line given various information.
- 4] Find the equations of parallels and perpendiculars.
- 5] Solve equations in 2 or 3 variables.
- 6] Fit a model to data.
- 7] Use appropriate technology to solve problems.
- 8] Simplify monomial and polynomial expressions.
- 9] Factor polynomials.
- 10] Solve quadratic equations by factoring or quadratic formula.
- 11] Simplify radical expressions.
- 12] Simplify expressions with complex numbers.
- 13] Simplify expressions with negative/fractional exponents.
- 14] Graph and apply quadratic functions.
- 15] Apply the distance and midpoint formulae.
- 16] Graph the equations of conic sections centered at origin.
- 17] Solve systems of simultaneous quadratic equations.
- 18] Find the composition and inverse of functions.
- 19] Solve variation problems.
- 20] Solve rational/fractional equations.
- 21] Simplify complex algebraic rational expressions.
- 22] Understand and use arithmetic sequences and series.
- 23] Understand and use geometric sequences and series.
- 24] Solve algebraic word problems.
- 25] Draw graphs in 3-space.
- 26] Perform operations with real numbers as exponents.
- 27] Find the equations of the conic sections, given information in the geometric definitions.
- 28] Explain the theory of equations – Rational Root Theorem and Fundamental Theorem of Algebra.
- 29] Use Synthetic Division and Synthetic Substitution.
- 30] Convert between exponential and logarithmic form.
- 31] Apply the log definition and the log laws.
- 32] Solve Exponential Equations.

- 33] Use determinants in solving systems of equations.
- 34] Study patterns that are iterative and recursive.
- 35] Identify maximum and minimum values of functions.
- 36] Distinguish between polynomial, rational, logarithmic, exponential functions.
- 37] Solve problems that can be modeled using polynomial, rational, logarithm, exponential functions.
- 38] Use combinations and permutations to compute probability.
- 39] Use the binomial theorem.
- 40] Use matrices to solve system of equation.

Assessment

Students are generally assessed by in-class tests and quizzes, which are administered regularly throughout a marking period. Generally, two quizzes are equivalent to a test. The students' attitude, effort, and quality of homework preparation will also impact their term grade to a small degree. Teachers informally assess students every day by asking pivotal questions, as well as questions involving mechanics or concepts, and the students' term grades may be positively affected to a small degree based on their responses.

A standardized midyear examination and final examination are administered to all students in this course in order to assess their long-term retention of the course material.

Technology Learning Objectives Addressed in This Course

(This section is for faculty and administrative reference; students and parents may disregard.)

Course activity: skills &/or topics taught

- 1] Graphing calculators are used to introduce quadratic function graphs
- 2] Graphing calculators are used to aid in the solution of Polynomial Equations
- 3] Graphing calculators are used to contrast graphs with horizontal or vertical shifts

Materials and Resources

Text: Dolciani et.al., Algebra 2 and Trigonometry. Houghton Mifflin, 1992.

Teachers use other texts for supplementary ideas, such as the McDougal Littell Algebra 2 text and the Glencoe Algebra 2 text. Review materials that match both of the departmental examinations are used by all teachers of the course. Some teachers may employ the software package "Algebra Plotter Plus" to have students investigate a concept at the Mac Lab. Teachers may also have students investigate problems with graphing calculators.