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.

AB CALCULUS (H/AP): COURSE # 342

Course Frequency: Full-year course, five times per week
Credits Offered: Five
Prerequisites: A final grade of at least C- in Precalculus/Intro. to Calculus H or B- in Precalculus/Intro. to Calculus AE

Background to the Curriculum

This course uses the text, Calculus, Graphical, Numerical and Algebraic, by Finney, Demana, Waits, and Kennedy, 1999 edition. It follows the syllabus for AB Calculus as outlined by the Educational Testing Service. Since its introduction in the mid-1960s, the course has used various editions of Thomas' Calculus, which then became Thomas/Finney Calculus, and ultimately the text now used. The text is followed closely, and the class completes seven chapters, as per the A.P. guideline. Additional material along the lines of preparation for the Advanced Placement exam is introduced, mostly during the second semester. Students are provided with old examinations – both the Multiple Choice and Free Response sections, as well as material obtained at recent ETS conferences.

Core Topics/Questions/Concepts/Skills

Limits and continuity
Differentiation: concepts, mechanics
Differentiation: applications
Definite integration: concepts, mechanics
Definite Integration: applications to exponential growth, population growth, business
Definite Integration: applications to engineering and science
The Fundamental Theorem of Calculus

Course-End Learning Objectives

Students will be able to:

1] Find the equations of linear, exponential, logarithmic, trigonometric functions.
2] Use regression analysis for lines, quadratics, exponentials, and logarithmic curves.
3] Use functions and graphs, and find their domain and range.
4] Work with parametric equations.
5] Compute all types of limits.
6] Work with continuous and discontinuous functions.
7] Differentiate between average and instantaneous rates of change.

8] Find the derivative of algebraic functions by definition.
9] Understand the concept of differentiability graphically.
10] Compute a numerical derivative using NDER on a graphing calculator.
11] Compute the derivatives of algebraic and transcendental functions.
12] Find tangent and normal lines to curves.
13] Use the product rule, quotient rule, and chain rule.
14] Differentiate implicitly.
15] Find velocity, acceleration, and jerk of a particle given its position.
16] Find extreme values of functions.
17] Apply the Mean Value Theorem.
18] Solve word problems involving optimization.
19] Solve word problems involving related rates.
20] Use linearization to approximate functional values.
21] Use Newton's Method.
22] Estimate with finite sums.
23] Find definite integrals geometrically, as well as by the Fundamental Theorem of Calculus.
24] Compute a definite integral using FNINT on a graphing calculator.
25] Evaluate anti-derivatives of algebraic and transcendental functions.
26] Approximate a definite integral numerically.
27] Use slope fields.
28] Solve Separable Differential Equations.
29] Integrate by parts.
30] Solve problems involving exponential growth and decay.
31] Solve problems involving population growth.
32] Use Euler's Method.
33] Understand and apply the definite integral as "Net Charge."
34] Find areas, volumes, and arc length by definite integration.
35] Apply the definite integral to unfamiliar situations.

Assessment

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

A standardized midyear examination is given. Most students take the AP exam and are then exempt from the final exam.

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 fit curves to data.
2] Graphing calculators are used to find numerical derivatives and numerical integrals.
3] Graphing calculators are used to solve problems not solvable by traditional methods.

Materials and Resources

Text: Calculus, Graphical, Numerical and Algebraic, by Finney, Demana, Waits, and Kennedy, 1999.

In addition to the text, teachers use old AP exams for reference, and some test questions are taken from them. Many old AP exams are given to students in the spring to prepare for the upcoming test. Extra optional review sessions are held either after school or in the evening or on the weekends to help students prepare for the Advanced Placement exam.