384 ADVANCED PLACEMENT CALCULUS
394 ADVANCED PLACEMENT EXAM PREP

GRADE: 11 and 12

LEVEL: AP

CREDITS: 5/5

RECOMMENDED PREREQUISITE: A grade of "A" or better in Pre Calculus 360 or teacher recommendation

BASIC TEXT: Calculus: Graphical, Numerical and Algebraic
Finney, Thomas, et al. Addison Wesley, 1995

SUPPLEMENTAL READINGS: None

REQUIRED MATERIALS: writing utensils, notebook, graphing calculator

COURSE DESCRIPTION:

This course is intended for mathematically talented, highly motivated students who will take the AP exam (AB) and may result in advanced credit for students taking Calculus in college. The curriculum is prescribed and follows a rapid pace. It includes the study of functions, limits, derivatives, integrals, applications, transcendental functions, and elementary differentials. Students are required to take the Advanced Placement Calculus AB Examination in May in order to receive AP credit for the course. Passing the AP exam qualifies a student for college credit at many colleges and universities around the country. A fee of approximately $85.00 is charged for the AP exam. The testing fee is required in October.

MISSION RELATED GOALS:

This class will provide the student with a variety of opportunities to demonstrate academic excellence and intellectual curiosity by communicating effectively, solving complex problems, and working with others toward a common goal.

STUDENT EXPECTATIONS FOR LEARNING ADDRESSED:

Students will be afforded opportunities to apply mathematical concepts to real-world applications. A variety of teaching methods will be used to foster an environment that promotes self-confidence and respect for others throughout the school and global community.

GENERAL PERFORMANCE OBJECTIVES:

The student will be able to:

1. Gain a solid foundation in the study of elementary functions;
2. Develop techniques in differential and integral calculus;
3. Apply the techniques acquired to problem-solving strategies in a variety of situations;
4. Connect and integrate the calculus to real world situations;
5. Use technology to develop concepts and investigate theory;
6. Benefit from on going review and self-evaluation

MASSACHUSETTS FRAMEWORK STRANDS:

This course goes well beyond the frameworks set by the state. The Advanced Placement test is administered nationally, and there is a strict course description determined by The College Board.

CURRICULUM FRAMEWORK LEARNING STANDARDS:

This course goes well beyond the frameworks set by the state. The Advanced Placement test is administered nationally, and there is a strict course description determined by The College Board.

UNITS AND THEMES:

I. Introduction – Review (7 days)
II. Limits and Continuity (11 days)
III. The Derivative (18 days)
IV. Application of Derivatives (20 days)
V. Integral Calculus (20 Days)
VI. Differential Equations and Mathematical Modeling (15 days)
VI. Applications of Definite Integrals (18 days)
VII Review, Mid-Term Finals (4 days)

COURSE OUTLINE:

I. Introduction – Review (7 days)

A. Plane Geometry
B. Algebra II
C. Trigonometry
D. Transcendental Functions

II. Limits and Continuity (11 days)

A. Intuitive Concept of a Limit
B. Continuity
C. Algebraic Limits
D. Trigonometric Limits
E. Limits Involving Infinity
F. Difference Quotient to find Tangent Lines

III. The Derivative (18 days)

A. Average Rate of change of a function
B. Definition of Derivative
C. Differentiation Rules
D. Applications Involving Velocity
E. Implicit Differentiation
F. Inverse Trig Functions and Logarithmic Functions

IV. Application of Derivatives (20 days)

A. Maxima, Minima and the Mean Value Theorem
B. First and Second Derivative Tests
C. Optimization
D. Applications Rational Functions
E. Applications with Radical and Transcendental Functions
F. Linearization and other approximation techniques (differentials)
G. Mathematical Modeling And Anti-derivatives
H. Related Rates

V. Integral Calculus (20 days)

A. Calculus and Area
B. Definite Integrals
C. Anti-derivatives
D. The Fundamental Theorem of Calculus
E. Indefinite Integrals
F. Approximation Methods (Trapezoid Rule)

VI. Differential Equations and Mathematical Modeling (15 days)

A. Slope Fields
B. Initial Value Problems
C. Integration by Substitution
D. Integration by parts
E. Exponential Growth
F. Newton's Law of Cooling

VII. Applications of Definite Integrals (18 days)

A. Integral as Net Change
B. Areas
C. Volumes Using Disks
D. Slice Method
E. Washer Method
F. Shell Method
G. Differential Equations and Mathematical Modeling

VIII Review, Mid-Term Finals (4 days)

IX Exam Preparation (45 days)

A. Review of Limits and continuity
B. Review of Derivatives
C. Review of Integrals
D. Review of Transcendental Functions
E. Differential Equations
F. Calculator Exercises
G. Multiple Choice Practice with out Calculator
H. Multiple Choice with Calculator
I. Open Response Practice
J. Test Taking Strategies

SUGGESTED INSTRUCTIONAL STRATEGIES:

1. Lecture
2. Written Exercises
3. Group Work
4. Projects
5. Use of Manipulatives
6. Use of a Variety of questioning techniques
7. Board Work
8. Calculator Activities
9. Student Presentations
10. A variety of assessment tools

SUGGESTED INTEGRATED ACTIVITIES:

1. Newton's Law of Cooling
2. Volumes of solids of revolution
3. Speed of falling objects
4. Study motion and how the derivative describes position, velocity, and acceleration
5. Exponential Growth and Decay
6. Investment Examples
7. Related rates

USE OF TOOLS/TECHNOLOGY

1. Graphing calculators
2. Computer Generated solids of revolution
3. Multiple overhead transparencies

ASSESSMENT TECHNIQUES

1. Tests
2. Quizzes
3. Partner Quizzes
4. Oral Presentation of Open Response Questions
5. Sample Multiple Choice exams released by the College Board
6. Sample Open Response Questions from previous exams.