Haverhill High School
Haverhill, Massachusetts

AP Calculus AB

Course Overview: The main objective in teaching AP Calculus is to enable students to appreciate the beauty of calculus and receive a strong foundation that will give them the tools to succeed in future mathematics courses. Students know that they will work harder than ever, and our expectation is that this hard work will enable them to succeed in the course. We work together to help students discover the joys of calculus.

Course Planner: The primary text is *Calculus—Single Variable*, third edition, Hughes-Hallett/Gleason/McMallum, et al. The following is a tentative outline breaking down the content, text location and time. We complete the material be the middle of April to allow time thereafter to review before the AP exam scheduled in early May.

A Library of Functions (Chapter 1)
Students complete this precalculus review over the summer.

Key Concept: The Derivative (Chapter 2) 3 weeks

1. How Do We Measure Speed?
2. Limits
3. The Derivative at a Point
4. The Derivative Function
5. Interpretation of the Derivative
6. The Second Derivative
7. Continuity and Differentiability

Graphing Calculator Activities (see Student Activity 1)

Shortcuts to Differentiation (Chapter 3) 5 weeks

1. Powers and Polynomials
2. The Exponential Function
3. The Product and Quotient Rules
4. The Chain Rule
5. The Trigonometric Functions
6. Applications of the Chain Rule and Related Rates
7. Implicit Functions
8. Linear Approximation and the Derivative
9. Using Local Linearity to find Limits

Graphing Calculator Activities (See Student Activities 2)

Using the Derivative (Chapter 4) 4 weeks

1. Using the First and Second Derivatives
2. Families of Curves
3. Optimization and Modeling
4. Theorems About Continuous and Differentiable Functions

Graphing Calculator Activities (See Student Activities 3)

Key Concept: The Definite Integral (Chapter 5) 3 weeks

1. How Do We Measure Distance Traveled?
2. The Definite Integral
3. Interpretations of the Definite Integral
4. Theorems About Definite Integrals

Graphing Calculator Activities (See Student Activities 4)

Constructing Antiderivatives (Chapter 6) 3 weeks

1. Antiderivatives Graphically and Numerically
2. Constructing Antiderivatives Analytically
3. Differential Equations
4. Second Fundamental Theorem of Calculus
5. The Equations of Motion

Graphing Calculator Activities (See Student Activities 5)

Integration (Chapter 7) 2 weeks

1. Integration by substitution
2. Approximating Definite Integrals

Graphing Calculator Activities (See Student Activity 6)

Using the Definite Integral (Chapter 8) 3 weeks

1. Areas and Volumes
2. Applications to Geometry

Differential Equations (Chapter 11) 4 weeks

1. What Is a Differential Equation?
2. Slope Fields
3. Separation of Variables
4. Growth and Decay
5. Applications and Modeling

Graphing Calculator Activities (See Student Activities 7)

Teaching Strategies

This course is run at a college level of work and rigor. It is understood that every day is critical in order to cover the entire content. Students begin work in the summer with an assignment to be completed then and turned in at the first class. Every class thereafter requires preparation and work in order to be successful.

Presuming that everyone does better when everyone does better, work and learning is encouraged to be done collaboratively both formally and informally. Activities intend to allow for explorations and discoveries related to the content areas. The learning environment encourages sharing of questions and answers. Students are always invited to approach and use the board as necessary.

Graphing calculators, TI-83 and TI-84 calculators specifically, are used regularly as a tool for graphical and numerical analyses. The "rule of four" is the rule of thumb as we move back and forth in understanding a function by analyzing it graphically, numerically, analytically and verbally.

Student Evaluation

Student progress is determined by class participation demonstrating the ability to verbally and in writing communicate understanding of the topics. Progress is also demonstrated by completing projects, take-home assignments, and calculator activities. Further assessment is made through the use of in-class quizzes that are cumulative, some requiring the calculator, some not. Some quizzes are open-response, some are multiple choice.

Starting in November, students are given six AP free-response questions to work on over a two-week period. At the end of this time, students are quizzed in class with one of the set of problems to be graded using the AP scoring guidelines. Beginning in February, multiple-choice sections of released exams are presented to work on over two weeks. Students are then quizzed in class with any possible small sample of the set. Work alternates between these two formats until the AP Exam.

Teacher Resources

Primary Textbook
Hughes-Hallett, Deborah, et al. *Calculus—Single Variable*. Third edition. New York: Wiley and Sons, 2002.

References
Lifshitz, Maxine. *Amsco's AP Calculus AB/BC: Preparing for the Advanced Placement Exams.* New York: Amsco School Publishing, 2004.

Kelly, Michael W. ARCO *Master the AP Calculus A & BC Test.* Third Edition. Thompson Publishing.

Lederman, David. *Multiple Choice & Free Response Questions in Preparation for the AP Calculus (AB) Examination.* Eighth Edition. D & S Marketing Systems, Inc.

Kahn, David S. *The Princeton Review, Cracking the AP Calculus AB & BC Exams.* 2004-2005 Edition. Random House, Inc.

Technology/Calculator Resources

Best, George, et al. *AP Calculus with the TI-83 Graphing Calculator*. 1998. Venture Publishing.

Antinone, Linda, et al. *Explorations, Calculus Activities.* 2004. Texas Instruments.

Foerster, Paul A. *Calculus Explorations*. 1998. Key Curriculum Press.

Graphing Calculator Activities

1. Best, 3.6, 3.2, 3.3
   TI Explorations, 1, 2
2. Best, 2.6, 2.7
   TI Explorations, 6
3. Best, 3.4, 3.8
   TI Explorations, 7
4. Best, 4.1, 4.2
   TI Explorations, 7
5. Best, 4.3, 4.4
   TI Explorations, 16
6. Best, 4.5, 4.6
   TI Explorations, 17
7. Best, 6.2
   TI Explorations, 14