

Advanced Placement Calculus AB

2009-2010 Ms. Gale

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Scope:

Calculus begins where elementary mathematics leaves off. It is the branch of mathematics that takes in algebra and geometry and adds one more ingredient: *the limit process*. This process allows us to solve more general problems that cannot be solved using *only* the methods you have studied previously. This course will be un-like any math class you have taken, yet use nearly every concept in its development. Calculus has applications in economics, engineering, physics, statistics, business, computer science, astronomy and many other fields. We will see some of these applications, however the emphasis will be on a theoretical understanding of calculus.

Materials: Larson, Calculus of a Single Variable, 8th edition, Houghton Mifflin
Graphing Calculator
Barrons AP Calculus Review Book (newest Edition)

Sequence: Real Numbers, Functions & Graphs (review)
Limits & Continuity
Differential Calculus & Applications
Integral Calculus & Applications
Inverse, Logarithmic & Exponential Functions
Inverse Trigonometric Functions

Grading Policy:

60% – 75% of each semester grade will be based on a percentage of total points of tests, quizzes, assignments and class participation.

25% – 40% of each semester grade will be based on the final exam.

Office Hours:

If you need to talk with me *for any reason* (mathematical, practical, personal etc.....), you should drop in at the beginning of break or lunch, or after school. If possible we can take care of business at that time or, if necessary, we can make an appointment. If you are having difficulties with a topic, you should see me immediately. Do not wait for the morning of a test!

General Expectations

Attendance: Regular attendance is critical for success in mathematics as the class work supplements the material presented in the textbook and vice versa. If an absence is unavoidable, I expect the student to copy the notes from another student and complete the assignment(s). If you have questions, bring the copied notes to office hours/appointment for clarification.

Homework: Here's some friendly advice...YOU MUST DO YOUR HOMEWORK!!! On the surface calculus appears to be like every other math class you've ever had and many of you are here because you have been able to use your talent and insights through pre-calculus math to get good grades without much old-fashioned effort. Alas, those days are over. Conceptually, calculus is so significantly different from your previous math classes that it is unlikely you can do well without regular practice and the place to begin is in doing your homework the evening it is assigned.

Go to www.CalcChat.com or Hotmath.com (xe63070de) for worked out solutions to odd-numbered problems.

Most homework will not be collected, however some problems will be designated "to be turned in" and will be due at the beginning of the next period. These problems should be done on a separate sheet of paper and will not be accepted late or after they have been graded and returned. For these problems I will be looking for completeness of solutions, format and clarity of presentation. (5-10 points each)

Participation: Students are expected to be participants in the learning process. Your contribution to the environment - positive or negative - will be considered when the semester grade is calculated. Participation includes, but is not limited to, making relevant observations, asking questions, remaining on task, having grade sheet and notebook up-to-date, being civil and helpful, attending regularly and being on time.

Make-Ups: The student may take the exam during class the day she returns or she must arrange a time of mutual convenience. A student that is absent the day before a test, but present when the test was scheduled, should be prepared to take the test with the class. Any extenuating circumstances must be discussed with me *prior* to the beginning of class. Feel free to use e-mail.

Review for AP Test: It is extremely helpful that at least a full day be spent reviewing for the AP exam by doing sample problems from the review book. This is particularly true if you are preparing for more than one AP exam. Some years the class has met one day during Easter break at school where the morning is spent on multiple choice questions and the afternoon is spent working on free response questions. The 2003 AP exam will serve as a practice test two weeks before the AP exam.

Calculus Benchmarks

- Demonstrate knowledge of both the formal and the graphical interpretation of limits of values of functions. This knowledge includes one-sided limits, infinite limits and limits at infinity.
- Prove and use theorems evaluating limits of sums, products, quotients and composition of functions.
- Use graphic calculators to verify and estimate limits.
- Prove and use special limits such as limits of $\sin(x)/x$ and $1-\cos(x)/x$ as x approaches 0.
- Demonstrate knowledge of both the formal definition and the graphical interpretation of continuity of a function.
- Demonstrate an understanding and the application of the Intermediate Value Theorem and the Extreme Value Theorem.
- Demonstrate an understanding of the formal definition of the derivative of a function.
- Demonstrate an understanding of the derivative of a function as the slope of the tangent line to the graph of the function.
- Demonstrate an understanding of the interpretation of the derivative as an instantaneous rate of change.
- Use derivatives to solve a variety of problems from physics, chemistry, economics, etc. that involve the rate of change of a function.
- Understand the relationship between differentiability and continuity.
- Prove derivative formulas and use them to find the derivatives of algebraic, trigonometric, exponential and logarithmic functions.
- Know the chain rule and its applications to the calculation of the derivative of a variety of composite functions.
- Find derivatives of parametrically defined functions and use implicit differentiation in a variety of problems.
- Compute derivatives of higher order.
- Know and apply Rolle's theorem, the Mean Value Theorem and L'Hopital's Rule.
- Use differentiation to sketch, by hand, graphs of functions. Identify maxima, minima, inflection points, and intervals in which the function is increasing or decreasing.
- Interpret differential equations geometrically via slope fields and solution curves.
- Use differentiation to solve optimization in a variety of pure and applied contexts.
- Use differentiation to solve related rate problems in a variety of pure and applied contexts.
- Know the definition of definite integral by using Riemann sums and use this definition to approximate integrals.
- Apply the definition of the integral to model problems in physics, economics, etc, obtaining the result in terms of integrals.
- Demonstrate knowledge and proof of the Fundamental Theorem of Calculus and use it to interpret integrals as antiderivatives.
- Students use definite integrals in problems involving area, velocity, acceleration and volume of a solid of revolution.
- Compute integrals of a wide variety of functions by using the traditional techniques of integration.
- Use calculators to approximate integrals and derivatives.
- Know the techniques of solution of selected elementary differential equations and their applications to a wide variety of situations including growth and decay.

Advanced Placement Exam Calculus AB

In order to provide additional motivation for the students and a way for me to adequately evaluate the AP Calculus class, all students are required to take the AP test in May 2010.

The AP Calculus Exam consists of (1) a multiple-choice section testing proficiency in a wide variety of topics, and (2) a problem section requiring you to demonstrate the ability to solve problems involving a more extended chain of reasoning. Each of the 2 sections are given equal weight in determining the score for the exam.

Note: The College Board does **not** expect that all students will be able to answer all the questions.

- Part A of the multiple-choice section prohibits the use of a calculator and contains 28 questions to be done in 55 minutes.
- Part B of the multiple-choice section contains some questions for which a graphing calculator is required and contains 17 multiple choice questions to be done in 50 minutes.
- Part A of the free-response section will contain some questions or parts of questions for which a graphing calculator is required and will contain 3 questions to be done in 45 minutes.
- Part B of the free-response section will **not** allow the use of a graphing calculator and will also contain 3 questions to be done in 45 minutes. During this portion of the test, you will be permitted to return to part A of the free-response but not permitted to use your calculator at this time.

Thus, each student is expected to bring to the exam a graphing calculator on which she can

- (1) produce the graph of a function within an arbitrary viewing window;
- (2) find the zeros of a function;
- (3) compute the derivative of a function numerically; and
- (4) compute definite integrals numerically.

The memory of each calculator need **NOT** be cleared prior to the exam. The TI-8X series is on the approved list of calculators. If you have (or plan to buy) a different graphing calculator, see me for the list of approved calculators. (Note: any calculator with a QWERTY board is prohibited.)

