

## AP Calculus BC Syllabus

Mrs. Kayla Smith

Planning hours: 6<sup>th</sup> Block

Tutoring times: 7:15-7:45 and 3:10-3:45

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Text: Calculus of a Single Variable AP Edition, Ninth Edition, Larson and Edwards, published by Brooks/Cole, Cengage Learning

Prerequisites: Pre-AP Algebra II, Pre-AP Pre-Calculus and a B or better in AP Calculus AB

Required Materials: Graphing calculator (TI-84 is preferred), 3-ring binder to be used exclusively for Calculus class, supplemental review materials to prepare for AP test: Barron's "How to Prepare for the AP Exam: Calculus" (provided)

- I. Review (5 days)
  - A. Lines
  - B. Functions and Graphs
  - C. Exponential Functions
  - D. Parametric Equations
  - E. Inverse Functions and Logarithms
  - F. Trigonometric Functions
- II. Limits and their properties (8 days)
  - A. Rates of Change and Limits
  - B. Finding limits algebraically, numerically, and graphically
  - C. Limits involving Infinity
  - D. Continuity
  - E. Rates of Change and Tangent Lines
- III. Differentiation (20 days)
  - A. Derivative of a Function
  - B. Differentiability
  - C. Rules of Differentiation
  - D. Velocity and Other Rates of Change
  - E. Derivatives of Trigonometric Functions
  - F. Chain Rule
  - G. Implicit Differentiation
  - H. Derivatives of Inverse Trigonometric Functions
  - I. Derivatives of Exponential and Logarithmic Functions
- IV. Applications of Differentiation (18 days)
  - A. Related Rates
  - B. Extreme Values of Functions
  - C. Mean Value Theorem
  - D. Connecting  $f'$  and  $f''$  with the graph of  $f$
  - E. Modeling and Optimization
  - F. Linearization and Newton's Method
- V. The Definite Integral (14 days)
  - A. Estimating with Finite Sums
  - B. Definite Integrals

- C. Definite Integrals and Antiderivatives
- D. Fundamental Theorem of Calculus
- E. Trapezoidal Rule

VI. Differential Equations and Math Modeling (15 days)

- A. Antiderivatives and Slope Fields
- B. Integration by Substitution
- C. Integration by Parts
- D. Exponential Growth and Decay
- E. Population Growth
- F. Numerical Methods

VII. Applications of Definite Integrals (14 days)

- A. Integral as Net Change
- B. Area in the Plane
- C. Volumes
- D. Lengths of Curves

VIII. L'Hopital's Rule (11 days)

- A. L'Hopital's Rule
- B. Relative Rates of Growth
- C. Improper Integrals
- D. Partial Fractions and Integral Tables

IX. Infinite Series (17 days)

- A. Power Series
- B. Taylor Series
- C. Taylor's Theorem
- D. Radius of Convergence
- E. Testing Convergence at Endpoints

X. Parametric, Vector, and Polar Functions (12 days)

- A. Parametric Equations
- B. Vectors in a Plane
- C. Vector-valued Functions
- D. Polar Coordinates and Polar Graphs
- E. Calculus of Polar Curves

XI. Calculus AP Test Review (15 days)

Students will be issued an AP Calculus review handbook (Barron's). We will use this book and released AP test items to prepare for the AP exam. Practice exams will be given, scored, and analyzed. Some will be done in groups while others will be completed individually.

\*Each topic will be presented numerically (as in a table of values or a set of ordered pairs), geometrically, symbolically, and verbally as students learn to communicate the connections between these representations.

Classroom activities and strategies: Students are expected to participate regularly in class discussions. Daily assignments will be checked by the teacher and corrected as a class. Students will assist in reviewing the previous lesson by asking and answering questions and presenting problems in a small-group or whole class settings.

Students may also, on occasion, work together in small groups to solve problems, complete an activity, or develop a project. For example, in developing the concept of optimization, students are asked to construct a paper box of maximum volume from a rectangle. Each group has a unique rectangle. Groups may communicate about processes and strategies, but not identical answers.

When solving problems, justification of responses and solutions is part of the routine. Students are encouraged to express their ideas in carefully written sentences that validate their process and conclusions.

Homework: Homework is given daily and I expect that it is completed daily. Homework is designed to enhance skills developed in class and is typically not graded on correctness but completeness. Some problems are extremely challenging, but I will always expect you to try something intelligent. Students' work should be THEIR work only, but study groups are encouraged. Students will have my contact information if homework help is needed at night. There are also several online resources dedicated to calculus homework help. Homework is collected in chunks after several concepts have been covered. Please, oh, please...do your homework completely and turn it in ON TIME. Late homework will not be accepted.

Assessment: Students will be assessed on daily assignments, projects, quizzes and tests all including AP Exam items. Quizzes will be given after one or two sections have been covered. Major tests will occur at the end of each unit. After a sufficient number of calculus concepts have been covered, students will be assigned weekly *AP problem sets*. These sets will include multiple choice questions as well as free-response items. The problem sets will be take-home assessments. Students are required to show all of their work or explain all of their processes to receive credit on each item of the problem set. The Problem Sets will alternate between calculator active and calculator prohibitive. Questions regarding these sets must be addressed before or after school.

At the conclusion of our AP test review, each student will complete a *mock AP exam* worth 100 points. This exam is graded like the real AP exam, and students will be awarded a score of 1 to 5. More information on the mock exam will be given as the end of the year approaches.

Students' grades are determined by the ratio of points earned to total points possible. A cumulative exam will be administered at the end of each trimester. Trimester exams are 20% of the students' final average. If the AP exam is taken at the end of the year it will count as the final trimester exam.

Calculators: Students should come to AP Calculus BC already knowing the basics of operating a graphing calculator. While many operations should be done without the aid of a calculator, several calculus problems require the support of technology to arrive at a solution. This course will teach students how to use a graphing calculator to help solve problems, interpret results, and support conclusions. Specifically, the calculator will be used to:

1. Increase the speed of normal calculations
2. Verify hand drawn graphs of functions
3. Create lines of best fit (based on entered data)
4. Verify hand computation of derivative and integral values.
5. Verify limits graphically.
6. Evaluate sequences and series.
7. Evaluate trigonometric functions and values.
8. Verify or explain various non-calculator results.
9. Justify solutions to complex problems.

As with the AP exam, portions of each unit test will require the use of a graphing calculator and portions will prohibit its use.

Goals: It is my goal that students in this class will learn strategies and develop the skills and techniques necessary to becoming a good problem-solver and a logical and analytical thinker. Students should be able to make connections among the different representations of functions (graphical, numerical, analytical and verbal). Although it is not required, my expectation is that everyone taking AP Calculus BC also takes the AP exam. Ultimately, the exposure to this kind of mathematics is good for you and will serve you well in whatever endeavors you pursue. I hope you get a taste of the expectations and the rigor of a college-level Calculus course.

AP Exam: It is an expectation that you complete the AP exam. Your AP exam is Tuesday, May 4th at 8 A.M. Please make arrangements to attend and be sure to register for your exam and pay fees at the appropriate time.