AP Calculus BC Syllabus

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Course Description:

AP Calculus BC is a college level course equivalent to a full year of calculus at most universities. The course is based on the College Board's Advanced Placement Calculus BC curriculum, whose purpose is "developing understanding of the concepts of calculus and providing experience with its methods and applications." The course will emphasize that most calculus concepts and problems can be viewed or represented several ways: graphically, numerically, algebraically and verbally. Graphing calculators are tools for moving between these representations, so we will use them regularly. The primary purpose of this course is to prepare students for the AP Exam as well as future college math courses Students will be required to work the problems from a graphical, numerical or analytical point of view and present their solutions both verbally and in writing. Students are expected to perform college level work.

Textbook: Stewart, James. Single Variable Calculus. Belmont, California: Brooks/Cole – Thomson Learning, 2008, 6th Edition.

Expectations:

Students are expected to:

- Attend class on a daily basis.
- Keep a class notebook of notes, model problems, and homework assignments with noted corrections.
- Attempt and/or complete every problem on assigned homework.
- Read the assigned textbook readings.
- Participate in class, group discussions, and problem solving activities.
- Schedule make-up deadlines with the teacher when an absence occurs

Materials needed

- Notebook
- Folder or binder
- Graphing Calculator TI-83, TI-84, or TI-89 recommended
- Completed Homework

Chapter 2: Limits and Continuity (1 day)

- Continuity and one-sided limits
- Infinite limits
- Intermediate Value Theorem

Chapter 3: Differentiation (15 days)

- Derivatives and rates of change
- Approximating rates of change from graphs and tables of data
- The derivative as a function
- Relating the graphs of f , f ' , and f ''
- The relationship between differentiability and continuity
- Differentiation formulas (sums, differences, products, and quotients)
- The chain rule
- Derivatives of trigonometric functions
- Implicit differentiation
- Rate of change in the natural and social sciences, including position, velocity, acceleration, and rectilinear motion— includes an oral presentation of an example of how rates of change are used in the natural and social sciences.
- Related Rates – For each problem, students are required to distinguish, in writing, between the values that are constant and the values that are used only at time t.
- Linear approximations and differentials—includes a calculator exercise where students zoom in on a point on a curve, noting how it begins to look like a tangent line in order to demonstrate the concept of linearization

Chapter 4: Applications of Differentiation (18 days)

- Maximum and minimum values on an interval
- Extreme Value Theorem
- Rolle's Theorem and the Mean Value Theorem
- First and Second Derivative Tests
- Increasing/Decreasing Test Concavity Test and inflection points
- Limits at infinity and horizontal asymptotes
- Summary of curve sketching
- Graphing with calculus and calculators
- Optimization
- Newton's Method
- Anti-derivatives and indefinite integration following directly from derivatives of basic functions

Chapter 5: Integrals (12 days)

- Properties of the definite integral
- Definite integral as a limit of Riemann sums
- Area under a curve using Riemann sums (left, right, and midpoint) and trapezoidal sums
- Approximating definite integrals represented analytically, graphically, and by tables of data
- Fundamental Theorem of Calculus
- Using the Fundamental Theorem of Calculus to evaluate definite integrals
- Net Change Theorem and net change vs. total change
- The Substitution Rule and the use of substitution of variables to evaluate definite integrals
- Integrals of symmetric functions

Chapter 7: Inverse functions, Exponential, Logarithmic, and Inverse Trigonometric functions (14 days)

- Inverse functions
- Finding the derivative of the inverse of a function at a given value
- Natural logarithmic functions—differentiation and integration
- Natural exponential function—differentiation and integration
- General logarithmic and exponential functions—differentiation and integration
- Exponential growth and decay
- Inverse trigonometric functions—differentiation and integration
- Indeterminate forms and L'Hospital's Rule

Chapter 8&9.1: Techniques of Integration (17 days)

- Integration by parts
- Trigonometric integrals
- Trigonometric substitution
- Integration by partial fractions
- Strategy for integration
- Approximate integration using Midpoint Rule, Trapezoidal Rule, and Simpson's Rule
- Error bounds
- Improper Integrals Types 1 and 2
- Arc length

Chapter 10: Differential Equations (5 days)

- Modeling with differential equations
- Finding the solution of an initial-value problem
- Use of direction fields (slope fields) to interpret a differential equation geometrically
- Drawing slope fields and solutions curves for differential equations
- Euler's method as a numerical solution of a differential equation
- Solving separable differential equations

Chapter 11: Parametric Equations and Polar Coordinates (11 days)

- Curves defined by parametric equations
- Calculus with parametric curves
- Polar coordinates
- Areas and lengths in polar coordinates

Chapter 12: Infinite Sequences and Series (24 days)

- Sequences
- Monotonic sequences (increasing or decreasing)
- Series (convergent or divergent)
- Convergence of a series defined in terms of the limit of the sequence of partial sums of a series Test for divergence of a series
- Properties of a convergent series

- The Integral Test for convergence or divergence and its relationship to improper integrals and areas of rectangles
- The Comparison Tests and the Limit Comparison Test
- Alternating Series Test and the Alternating Series Estimation Theorem
- Absolute convergence and the Ratio and Root Tests
- Strategy for testing series
- Power series and radius and interval of convergence Taylor and Maclaurin series for a given function
- Maclaurin series for e^x , $\frac{1}{1-x}$,sin x, cos x, and $\tan^{-1}(x)$
- Applications of Taylor Polynomials

From AP Website: Vectors (3 days)

REVIEW FOR THE AP EXAM*

- 2-3 Weeks
- Various Released Exams –Multiple Choice
- Various Free Response Questions Released on AP Central