AP Calculus BC
2017-2018
Brief Description of Course

AP Calculus BC:

AP Calculus BC course includes integration and the applications of integration, differential equations and applications, infinite series and applications, parametric, polar equations, vector-valued functions and applications. Course includes intensive use of graphing calculators, analysis of problems, describing and writing about calculus concepts and their applications and also free response questions.

Unit Information

Unit Name or Timeframe: Chapter
4: Integration. (24 days) **Content and/or Skills Taught:**

1. Compute simple anti-derivatives directly using basic integration rules.
2. Use the anti-derivative to solve problems involving motion along a straight line when given initial conditions. This includes position, velocity and acceleration.
3. Understand the concept of area under a curve using a Riemann sum over equal subdivisions.
4. Compute Riemann sums using left endpoints, right endpoints, and midpoints as evaluation points.
5. Use the limit of a Riemann sum to calculate a definite integral.
6. Use the First Fundamental Theorem of Calculus to evaluate definite integrals. 7. Calculate anti-derivatives using substitution of variables and change of limits.
8. Use the graphing calculator to compute definite integrals numerically.
9. Use the Mean Value Theorem for integrals to find the average value of a function on an interval.
10. Use the Second Fundamental Theorem of Calculus to find derivatives. 11. Use the Trapezoidal Rule to approximate area under a curve.

Major Assignments and/or Assessments:
Unit Name or Timeframe:
Chapter 5: Logarithmic, Exponential, and Other Transcendental Functions. (15 days) **Content and/or Skills Taught:**

1. Review properties of the natural log function and the exponential function.
2. Define the natural log function as the under the curve for f(x) = 1/x, from 1 to x.
3. Differentiate exponential and logarithmic functions.
4. Find the derivative of the inverse of a function.
5. Use logarithmic differentiation to find derivative of complicate functions. 6. Differentiate and integrate general exponential and logarithmic functions. 7. Differentiate and Integrate inverse trig functions.

Major Assignments and/or Assessments:
Unit Name or Timeframe:
Chapter 6: Differential Equations. (8 days) **Content and/or Skills Taught:**

1. Construct a slope field to show the geometric interpretation of a differential equation, and use a slope field to show the solution curves for a differential equation.

2. Approximating function values using Euler's method.
3. Find general and particular solutions of differential equations and use separation of variables, including y' = ky, for growth and decay, and y' = ky(1-y/L) for the logistic equation.

Major Assignments and/or Assessments:
Unit Name or Timeframe:
Chapter 7: Applications of Integration. (12 days) **Content**
and/or Skills Taught:
1. Use definite integral to find the area under a curve.
2. Use definite integrals to find the area between two curves.
3. Use definite integrals to find the volume of solids of revolution using disc and washer methods, and solids of a known cross sectional area.
4. Use definite integrals to find the arc length of a curve. 5. Using definite integrals to find work.

Major Assignments and/or Assessments:
Unit Name or Timeframe:
Chapter 8: Integration Techniques, L'Hopital's Rule, and Improper Integrals. (14 days) **Content**
and/or Skills Taught:
1. Review integration techniques.
2. Use integration by parts to evaluate integrals.
3. Use trig identities to change an integral into a form that can be evaluated directly.
4. Use partial fractions to evaluate an integral.
5. Identify and manipulate indeterminate forms in the application of L'Hopital's Rule.
6. Convergence and divergence definitions. 7. Use improper integrals to evaluate definite integrals with infinite limits.

Major Assignments and/or Assessments:
Unit Name or Timeframe: Chapter
9: Infinite Series. (42 days) **Content**
and/or Skills Taught:
1. Sequences: their properties, and finding their limits.
2. Bounded and monotonic behavior of sequences.
3. Definition of series, and nth partial sum.
4. Convergent and divergent series, including geometric series and telescoping series.
5. Protocol for nth term test for divergence.
6. The integral test and p-series test, including harmonic series.
7. Direct comparison and limit comparison tests.
8. Alternating series test and alternating series remainder.
9. Absolute and conditional convergence.
10. Ratio and root tests.
11. Taylor polynomial approximations of elementary functions, including Maclaurin polynomials.
12. Taylors Theorem to find the Lagrange form of the remainder of a Taylor polynomial.
13. Power series, including radius and intervals of convergence.
14. Differentiation and integration of a power series, including their intervals of convergence.

15, Protocol for representing functions using power series, including operations.   16. Taylor and Maclaurin series representations of elementary functions.

Major Assignments and/or Assessments:
Unit Name or Timeframe:
Chapter 10: Parametric Equations, and Polar Coordinates. (7 days)   **Content and/or Skills Taught:**
1. Parametric equations: graphing and eliminating the parameter.
2. Parametric form of a derivative as it applies to slope and arc length of a curve.
3. Polar coordinates, polar conversion, and polar graphs.
4. Polar form of a derivative as it applies to slope.
5. Area of a polar region and arc length of a polar curve.

Major Assignments and/or Assessments:
Unit Name or Timeframe:
Chapter 12: Vector-Valued Functions. (4 days)   **Content and/or Skills Taught:**
1. Vectors and vector-valued functions.
2. Vector form of a derivative. 3. Applications of vector derivative, including velocity, acceleration, and speed.

Major Assignments and/or Assessments:
Textbooks
Title: Calculus of a Single Variable; *AP Edition
Publisher: Houghton Mifflin Company
Published Date: 2010
Author: Ron Larson
Second Author: Bruce Edwards
Description: 9th Edition

Other Course Materials

Material Type: Graphing Calculator

Description:

I cover all the material listed in the BC Calculus topical outline. Effort is made to teach all topics verbally, analytically, graphically, and numerically. I use a graphing calculator extensively in my classroom. Every new concept I try to show the class how it is represented graphically and then use this

graph to make the connection to the concept I am teaching. Students use the table features to look at how their graphs are changing. They look at both the graphs, tables and the solve features on the graphing calculator (derivatives and numerical integration) to compare how their solutions are supported in many ways. They look at their calculators graphically, analytically, and numerically to discuss with each other how each method is a solution of the problem. I have students look at graphs and then work backwards to explain derivatives and integrals. They experiment with data on the calculator to write meaningful conclusions. We use graphing calculators to show rates of change, slopes of tangent lines, concavity, maximums and minimums, Riemann Sums, area under a understanding. We use the graphing calculator very often to show the relationship between the function, its derivative, and the integral of the function. It is an excellent way to tie the concepts together. (Graphing example: Students need to be able to find inflection points and relative maximums and minimums by interpreting the graph of f ' on their graphing calculator or examining a graph of f ' on a non-calculator question.). Students will also display solutions through oral/verbal presentations.

Exams are given in two parts. Part 1 is multiple choice and Part 2 is free response. Assessment stresses that free response questions are appropriately justified. The four calculator functions are emphasized, modeled, practiced, and assessed: calculating the value of a definite integral; calculate the derivative of a function at a given value; find the zeros of a function; produce a graph of a function within an arbitrary viewing window.

Websites
URL:http://apcentral.collegeboard.com/apc/Controller.j **Description:**
AP Central website.
URL:http://lyris.collegeboard.com/read/login/?go=http:
Description:
AP Calculus Electronic Discussion Group (EDG)

Additional Information
Requirement: Student Expectations: **How**
Course Meets Requirement:

This is my 21st year teaching mathematics, my first year teaching AP Calculus BC, and I have taught AP Calculus AB for six years. I have discussed pacing, assessment, materials, and teaching strategies with other AP Calculus teachers. My course syllabus, homework assignments, and assessments are closely aligned with the course taught by the head of the mathematics department of a large Anchorage high school. I also supplement with materials that are strongly recommended from previous AP workshops and institutes that I have attended. My outline is closely aligned with the Anchorage school district's AP Calculus outline.

My students must justify their Calculus both in written form as well as verbally. They present problems on the board and explain to the class and myself the ideas we are learning. I stress that they use the proper language of Calculus to do this such as explaining why a point is a relative maximum. I have students work in groups of 3-4 where they must teach each other the problems I assign. Their roles include asking questions of each other, explaining it to the rest of the group, and checking for understanding. On many homework assignments and frequently on tests or quizzes I have the students write an explanation on the process they are demonstrating.