Southern Regional High School District
Course of Study

Department_____Mathematics_____

Course Title: Calculus I AP

Essential Questions of the Course:

1. What is the meaning of a limit, a derivative, and an anti-derivative?
2. How can these topics enhance a student's understanding of functions and their behavior?
3. What is the meaning of definite integral?
4. What is the meaning of the Fundamental Theorem of Calculus?

Assessments:

1. Students will be assessed through take-home examinations. On the day that these exams are due, students will be given a short (20 minute) short answer test on the same material. (Weight: 70% take-home and 30% In-Class)
2. Periodic quizzes will be given on daily material.
3. Homework will be assigned daily to give students an opportunity to evaluate their progress in understanding new material.

Unit of Study

Unit Title: Five-Day Walk Through Calculus

Essential Questions of the Unit:

1. What is Instantaneous Rate of Change?
2. How can an equation, a graph or a table determine Rate of Change?
3. What is an Integral of a Function?
4. How can definite integrals be approximated using Trapezoids?
5. What is a limit?

Assessments:

1. Students will be given daily activity sheets to complete to help them understand the material discussed in class.
2. No formal assessment will be completed in this unit. All the topics will be revisited in depth throughout the course.

Content:

1. Instantaneous Rate of Change
2. Rate of Change
3. An integral of a function
4. Approximating a definite integral using trapezoids
5. Limits of a function

Skills:

Students will develop an understanding for the five main topics to be included in the Calculus I AP course. Students will not develop proficiency in any of the topics. It is simply a quick five-day walk through the main topics of the course.

Purpose / Rationale of the Unit:

The purpose of this unit to give the students an overview of what calculus is all about. Many students have not seen the big picture prior to studying a class. This walk through will give the students an exposure to what lies ahead in their study of Calculus.

New Jersey Core Curriculum Content Standards:

- Standard 4.15:
  All Students Will Develop An Understanding Of The Conceptual Building Blocks Of Calculus And Will Use Them To Model And Analyze Natural Phenomena

Time Frame of Unit: 5 days

Instructional Activities:

1. Students will study the motion of a door opening and closing, study the graph, and approximate the instantaneous rate of change of the angle formed by the door.
2. Students will using equations, graphs, and table to study rate of change. Students will learn to integrate the three representations together.
3. An integral is area. Students will learn the physical meaning of area by studying a velocity graph.
4. Not all functions are made up of straight-line segments; therefore, it is difficult to approximate the area under all curves. Trapezoids will be used to find an approximate area under a curve.
5. The concept of a limit is a foundational topic to all calculus topics. Students will be introduced to what a limit of a function is through a series of questions.

Materials and Resources:

- Material is available in Calculus by Paul A. Foerster (Key Curriculum Press, 1998) Chapter 1
- Effects of Absolute Value Lab by Jim Rahn
- Exploring Power and Exponential Functions Lab by Jim Rahn

Unit of Study

Unit Title: Prerequisites of Calculus

Essential Questions of the Unit:

- What are the essential things you must already know about functions before you start your study of calculus?
- What are each student's weaknesses or misunderstandings?
- How can functions be studied numerically, graphically, through tables, and analytically? How do these four methods work together for a deeper understanding of functions?

Assessments:

1. Students will be given daily reading assignments and written assignments to monitor their understanding of the prerequisites of calculus.
2. Periodic quizzes will be given to help students assess their immediate understanding of new ideas.
3. An end of the unit take home exam will be given upon the completion of the study of the prerequisites.

Content:

Lines, slope, equations of lines, functions, domain and range, viewing an interpreting graphs, symmetry, piecewise defined functions, the absolute value function, composite functions, exponential functions, parametric equations, inverse functions, logarithmic functions, trigonometric functions, periodicity, and inverse trigonometric functions

Skills:

1. To be able to calculate slope
2. Write equations of lines
3. Understand and identify domain and range of a function
4. Understand and use piecewise functions
5. Understand and use composite functions
6. Understand the behavior a exponential functions (including domain and range)
7. Understand the behavior of logarithmic functions (including domain and range)
8. Understand how to graph equations with parametric equations
9. Understand how to write an inverse function (including domain and range)
10. Understand all six trigonometric functions (including domain and range)
11. Understand all six inverse trigonometric functions (including domain and range)

Purpose / Rationale of the Unit:

To build a firm foundation of pre-calculus topics and essential ideas about functions for students entering a study of calculus

New Jersey Core Curriculum Content Standards:

- Standard 4.3:

All Students Will Connect Mathematics To Other Learning By Understanding The Interrelationships Of Mathematical Ideas And The Roles That Mathematics And Mathematical Modeling Play In Other Disciplines And In Life

Time Frame of Unit: 11 days

Instructional Activities:

1. Students will read and study material presented in course textbook and then challenged with questions about their reading through examples.

2. Homework assignments will be discussed to insure a good understanding of the prerequisites.

3. The graphing calculator will be integrated into various exercises to help the student visualize the problems.

4. A CBL activity will be used to help students review their knowledge of transforming a basic sine or cosine function.

5. Students will be asked to make conclusions after working through explorations scattered throughout the unit.

Materials and Resources:

- Calculus by Finney, Demana, Waits, and Kennedy (Scott Foresman – Addison Wesley, 1999)
- Real World Math with the CBL System, Texas Instruments
- Bouncing Lab by Jim Rahn
- Zeros of a Polynomial Lab by Jim Rahn
- Transforming Parabolas and Circles Lab by Jim Rahn
- Exploring Trigonometric Functions by Jim Rahn
- Fitting Lines to Data Lab by Jim Rahn
- Hidden Behavior Lab by Jim Rahn
- Investigating Transformations with the STO key Lab by Jim Rahn
- Pendulum Lab by Jim Rahn
- Recursive Sequence Lab by Jim Rahn
- Monster Wall Lab on Parametric Equations Lab by Jim Rahn
- Exponential Function Lab by Jim Rahn
- Finding Zeros Lab by Jim Rahn
- Tuning Fork Lab by Jim Rahn
- Exploring Exponential Functions Lab by Jim Rahn

Unit of Study

Unit Title: Limits and Continuity

Essential Questions of the Unit:

1. What is a limit of a function?
2. How are limits of a function defined?
3. How does continuity depend on limits?

Assessments:

1. Students will be given daily reading assignments and written assignments to monitor their understanding of the prerequisites of calculus.
2. Periodic quizzes will be given to help students assess their immediate understanding of new ideas.
3. An end of the unit take home exam will be given upon the completion of the study of the limits and continuity.

Content:

1. Average and instantaneous speed
2. Definition of a limit
3. Properties of a limit
4. One-sided and Two-sided limits
5. Sandwich Theorem
6. Continuity at a point
7. Continuous Functions
8. Composite Functions
9. Intermediate Value Theorem
10. Rates of Change

Skills:

1. To be able to calculate average and instantaneous speeds.
2. To be able to define and calculate limits of a function and apply properties of a limit.
3. To be able to use the Sandwich Theorem to calculate limits.
4. To be able to find and verify end behavior models for various functions.
5. To be able to calculate limits as the domain values approach infinity (identify vertical and horizontal asymptotes).
6. To be able to identify intervals where a function is continuous.
7. To be able to rewrite a removable discontinuity by extending or modifying the function.
8. To be able to apply the Intermediate Value Theorem and the properties of algebraic combinations and composites of continuous functions.
9. To be able to apply directly the definition of slope of a curve in order to calculate slopes
10. To be able to find equations of tangent lines and normal lines to a curve at a given point.
11. To be able to find average rate of change of a function.

Purpose / Rationale of the Unit:

1. To understand the inter-relationship between limits and continuity of a function.
2. To apply these ideas to find the slope of a function at a given point.

New Jersey Core Curriculum Content Standards:

- Standard 4.5:
  All Students Will Regularly And Routinely Use Calculators, Computers, Manipulatives, And Other Mathematical Tools To Enhance Mathematical Thinking, Understanding, And Power

Time Frame of Unit: 10 days

Instructional Activities:

1. Students will read and study material presented in course textbook and then challenged with questions about their reading through examples.
2. Homework assignments will be discussed to insure a good understanding of the prerequisites.
3. The graphing calculator will be integrated into various exercises to help the student visualize the problems.
4. Students will be asked to make conclusions after working through explorations scattered throughout the unit.
5. Students will work on several exercises throughout the unit cooperatively to enhance their understanding of limits and continuity.

Materials and Resources:

- Calculus by Finney, Demana, Waits, and Kennedy (Scott Foresman – Addison Wesley, 1999)
- Limit Lab – Developed by Jim Rahn
- Intermediate Value Theorem Lab by Jim Rahn
- Investigating Limits through Tables Lab by Jim Rahn
- Calculus I AP with the TI-89 Activities
- Continuity Lab by Jim Rahn
- Understanding the Definition of a Limit Lab by Jim Rahn
- Investigating Limits on the TI-8 or TI-89 Calculator Lab by Jim Rahn

Unit of Study

Unit Title: Derivatives

Essential Questions of the Unit:

1. How does one determine the slope of a function at a given point?
2. What is differential calculus?
3. How does one find the derivative of a function?

Assessments:

1. Students will be given daily reading assignments and written assignments to monitor their understanding of the prerequisites of calculus.
2. Periodic quizzes will be given to help students assess their immediate understanding of new ideas.
3. An end of the unit take home exam will be given upon the completion of the study of the derviatives.

Content:

1. Definition of a derivative
2. Notation related to derivatives of a function
3. Relationships between graphs of f and f ‘
4. Graphing the derivative from data
5. When does a derivative fail to exist?
6. Differentiability implies local linearity and continuity
7. Finding derivatives graphically and with a calculator
8. Intermediate Value Theorem for Derivatives
9. Rules for derivatives
10. Second and higher order derivatives
11. Motion along a line
12. Derivatives of trigonometric functions
13. Chain Rule
14. Implicit differentiation
15. Derivatives of inverse trigonometric functions
16. Derivatives of exponential/logarithmic functions

Skills:

1. To be able to calculate slopes and derivatives using the definition of a derivative.
2. To be to graph f from f’ and f’ from the graph of f.
3. To be able to find where a function is not differentiable and distinguish between corners, cusps, discontinuities, and vertical tangents.
4. To be able approximate derivatives numerically and graphically.
5. To be able use the rules for derivatives.
6. To be able use derivatives to analyze straight line motion and solve problems with rates of change.
7. To be able use the rules for differentiating trigonometric functions.
8. To be able to differentiate composite functions using the chain rule.
9. To be able to find slopes of parametrized curves.
10. To be able to find derivatives using implicit differentiation.
11. To be able to find derivatives of the inverse trigonometric functions.
12. To be able to calculate derivatives of exponential and logarithmic functions.

Purpose / Rationale of the Unit:

1. Derivatives can be used to understand the behavior of a function. This unit develops a students ability to find a derivative using the definition of a derivative. This definition is also based on a limit, which was developed in the previous unit.
2. Students must know how to find a derivative for many applications exercises in the nest part of the course.

New Jersey Core Curriculum Content Standards:

- Standard 4.15:
  All Students Will Develop An Understanding Of The Conceptual Building Blocks Of Calculus And Will Use Them To Model And Analyze Natural Phenomena
- Standard 4.16:
  All Students Will Demonstrate High Levels Of Mathematical Thought Through Experiences Which Extend Beyond Traditional Computation, Algebra, And Geometry

Time Frame of Unit: 30 days

Instructional Activities:

1. Students will read and study material presented in course textbook and then challenged with questions about their reading through examples.
2. Homework assignments will be discussed to insure a good understanding of a derivative.
3. The graphing calculator will be integrated into various exercises to help the student visualize the problems.
4. Students will be asked to make conclusions after working through explorations scattered throughout the unit.
5. Students will work on several exercises throughout the unit cooperatively to enhance their understanding of derivatives.

Materials and Resources:

- Calculus by Finney, Demana, Waits, and Kennedy (Scott Foresman – Addison Wesley, 1999)
- Calculus I AP with the TI-89 Activities
- Estimating Derivatives Graphically Lab by Jim Rahn
- Estimating Derivatives with the Difference Quotient Lab by Jim Rahn
- Zooming In to Estimate Slope of a Function Lab by Jim Rahn
- Motion Along a Line Lab by Jim Rahn
- Discovering Derivative Relationships Lab by Jim Rahn
- Exploration Lab on Derivatives by Jim Rahn
- Discovering the Chain Rule Lab by Jim Rahn
- Understanding Relationships Between Inverse Functions Lab (1 and 2) by Jim Rahn
- Discovering a Derivative Graphically and Numerically Lab by Jim Rahn

Unit of Study

Unit Title: Applications of Derivatives

Essential Questions of the Unit:

1. How can derivatives be used to draw conclusions about extreme values of a function and the general shape of a function's graph.
2. How does a tangent line capture the shape of a curve near a point of tangency?
3. How can we deduce the rate of change of a function we cannot measure from rates of change we already know?
4. How can we find a function when we know its derivative?

Assessments:

1. Students will be given daily reading assignments and written assignments to monitor their understanding of the prerequisites of calculus.
2. Periodic quizzes will be given to help students assess their immediate understanding of new ideas.
3. An end of the unit take home exam will be given upon the completion of the study of the applications of derivatives.

Content:

1. Finding Local and Absolute extreme values
2. Mean Value Theorem
3. Increasing and Decreasing Functions
4. First Derivative test for Local Extrema
5. Concavity
6. Second Derivative Test for Local Extrema
7. Linear Approximations
8. Differentials
9. Estimating Change with Differentials
10. Sensitivity to Change
11. Related Rate Equations
12. Simulating Related Motion

Skills:

1. To be able to determine local or global extreme values of a function.
2. To be able to apply the Mean Value Theorem and find the intervals on which a function is increasing or decreasing.
3. To be able to use the First and Second Derivative Tests to determine local extreme values of a function.
4. To be able to determine the concavity of a function and points of inflection based on the Second Derivative test.
5. To be able find linearizations and use Newton's Method to approximate zeros of a function.
6. To be able to estimate the change in a function using differentials.
7. To be able to solve related rate problems.

Purpose / Rationale of the Unit:

To demonstrate how derivatives can be used to gather information about a function.

New Jersey Core Curriculum Content Standards:

- Standard 4.13:
  All Students Will Develop An Understanding Of Algebraic Concepts And Processes And Will Use Them To Represent And Analyze Relationships Among Variable Quantities And To Solve Problems
- Standard 4.15:
  All Students Will Develop An Understanding Of The Conceptual Building Blocks Of Calculus And Will Use Them To Model And Analyze Natural Phenomena
- Standard 4.16:
  All Students Will Demonstrate High Levels Of Mathematical Thought Through Experiences Which Extend Beyond Traditional Computation, Algebra, And Geometry

Time Frame of Unit: 25 days

Instructional Activities:

1. Students will read and study material presented in course textbook and then challenged with questions about their reading through examples.
2. Homework assignments will be discussed to insure a good understanding of the derivative.
3. The graphing calculator will be integrated into various exercises to help the student visualize the problems.
4. Students will be asked to make conclusions after working through explorations scattered throughout the unit.
5. Students will work on several exercises throughout the unit cooperatively to enhance their understanding of derivatives.

Materials and Resources:

- Calculus by Finney, Demana, Waits, and Kennedy (Scott Foresman – Addison Wesley, 1999)
- Calculus I AP with the TI-89 Activities
- Maximization Lab by Jim Rahn
- Understanding the Relationship between a Function and Its Derivative Lab by Jim Rahn
- Similarities and Differences in F' Lab by Jim Rahn
- Estimating Derivatives Numerically Lab by Jim Rahn
- Motion along a line Lab by Jim Rahn

Unit of Study

Unit Title: The Definite Integral

Essential Questions of the Unit:

1. How does instantaneous change accumulate over an interval to produce a function?
2. How does one find the area under a curve (Integral Calculus)?

Assessments:

1. Students will be given daily reading assignments and written assignments to monitor their understanding of the prerequisites of calculus.
2. Periodic quizzes will be given to help students assess their immediate understanding of new ideas.
3. An end of the unit take home exam will be given upon the completion of the study of applications of a derivative.

Content:

1. Distance traveled	2. Rectangular Approximation Method (RAM)
3. Volume of a Sphere	4. Riemann Sums
5. Terminology and Notation for Integration	6. Integrals on a Calculator
7. Integrals with Discontinuous Functions	8. Properties of Definite Integrals
9. Average Value of a Function	10. Mean Value Theorem for Definite Integrals
11. Connecting Differential and Integral Calculus	12. Fundamental Theorem of Calculus
13. Graphing an integral	14. Area Connection
15. Trapezoidal Rule	16. Other Approximation Methods

Skills:

1. To be able to approximate the area under the graph of a nonnegative continuous function by using rectangle approximation methods.
2. To be able to interpret the area under a graph as a net accumulation of a rate of change.
3. To be able to express the area under a curve as a definite integral and as a limit of Riemann Sums.
4. To be able to compute the area under a curve using a numerical integration procedure.
5. To be able to express the area under a curve as a definite integral and as a limit of Riemann Sums.
6. To be able to compute the area under a curve using a numerical integration procedure.
7. To be able to apply rules for definite integrals and find the average value of a function over a closed interval.
8. To be able to apply the Fundamental Theorem of Calculus.
9. To understand the relationship between the derivative and the definite integral as express in both parts of the Fundamental Theorem of Calculus.
10. To be able approximate the definite integral by using Trapezoids and Simpson's Rule.

Purpose / Rationale of the Unit:

To help students build the relationship between differential and integral calculus (The Fundamental Theorem of Calculus).

New Jersey Core Curriculum Content Standards:

- Standard 4.15:
  All Students Will Develop An Understanding Of The Conceptual Building Blocks Of Calculus And Will Use Them To Model And Analyze Natural Phenomena
- Standard 4.16:
  All Students Will Demonstrate High Levels Of Mathematical Thought Through Experiences Which Extend Beyond Traditional Computation, Algebra, And Geometry

Time Frame of Unit: 26 days

Instructional Activities:

1. Students will read and study material presented in course textbook and then challenged with questions about their reading through examples.
2. Homework assignments will be discussed to insure a good understanding of the prerequisites.
3. The graphing calculator will be integrated into various exercises to help the student visualize the problems.
4. Students will be asked to make conclusions after working through explorations scattered throughout the unit.
5. Students will work on several exercises throughout the unit cooperatively to enhance their understanding of integrals and the relationship to derivatives.

Materials and Resources:

- Calculus by Finney, Demana, Waits, and Kennedy (Scott Foresman – Addison Wesley, 1999)
- Calculus I AP with the TI-89 Activities
- Curve Sketching Lab by Jim Rahn
- Newton's Method Lab by Jim Rahn
- Differentials and Linear Approximation Lab by Jim Rahn
- The Trapezoidal Rule Lab by Jim Rahn
- Investigating Riemann Sums Lab by Jim Rahn
- Exploring Numerical Integration Lab by Jim Rahn
- Integrating with Logarithmic and Exponential Functions Lab by Jim Rahn
- Understanding the 2nd Fundamental Theorem of Calculus Lab (1 and 2) by Jim Rahn

Unit of Study

Unit Title: Differential Equations and Mathematical Modeling

Essential Questions of the Unit:

1. How can differential equations be used to predict the behavior of a function?
2. How can differential equations be analyzed analytically, graphically, and numerically to make predictions?

Assessments:

1. Students will be given daily reading assignments and written assignments to monitor their understanding of the prerequisites of calculus.
2. Periodic quizzes will be given to help students assess their immediate understanding of new ideas.
3. An end of the unit take home exam will be given upon the completion of the study of the differentials and mathematical modeling.

Content:

1. Solving initial value problems	2. Antiderivatives and Indefinite integrals
3. Properties of Indefinite integrals	4. Power Rule in Integral Form
5. Trigonometric Integrands	6. Substitution in Indefinite Integrals
7. Separable Differential Equations	8. Integration by parts
9. Law of Exponential Change	10. Newton's Law of Cooling

Skills:

1. To be able to construct antiderivatives using the Fundamental Theorem of Calculus.
2. To be able to find antiderivatives of polynomials, e^{kx}, and selected trigonometric functions of kx, as well as linear combination of functions.
3. To be able to solve initial value problems of the form $\frac{dy}{dx} = f(x)$.
4. To be able to construct slope fields using technology and interpret slope fields as visualizations of differential equations.
5. To be able to compute indefinite and definite integrals by the method of substitution.
6. To be able to solve differential equations of the form $\frac{dy}{dx} = f(x)$.
7. To be able to use integration by parts to evaluate indefinite integrals and definite integrals.
8. To be able to solve problems involving exponential growth and decay in a variety of applications.
9. To be able to use Euler's method and the improved Euler's method to find an approximate solution to a differential equation with initial values.

Purpose / Rationale of the Unit:

1. To show students how differential calculus can be used to make conclusions about the behavior of a function.
2. To integrate analytical, graphical and numerical techniques in making predictions about the future status of a substance based on it rate of change.

New Jersey Core Curriculum Content Standards:

- Standard 4.13:
  All Students Will Develop An Understanding Of Algebraic Concepts And Processes And Will Use Them To Represent And Analyze Relationships Among Variable Quantities And To Solve Problems
- Standard 4.15:
  All Students Will Develop An Understanding Of The Conceptual Building Blocks Of Calculus And Will Use Them To Model And Analyze Natural Phenomena
- Standard 4.16:
  All Students Will Demonstrate High Levels Of Mathematical Thought Through Experiences Which Extend Beyond Traditional Computation, Algebra, And Geometry

Time Frame of Unit: 22 days

Instructional Activities:

1. Students will read and study material presented in course textbook and then challenged with questions about their reading through examples.
2. Homework assignments will be discussed to insure a good understanding of the definite integral.
3. The graphing calculator will be integrated into various exercises to help the student visualize the problems.
4. Students will be asked to make conclusions after working through explorations scattered throughout the unit.
5. Students will work on several exercises throughout the unit cooperatively to enhance their understanding of differentials and mathematical modeling.

Materials and Resources:

- Calculus by Finney, Demana, Waits, and Kennedy (Scott Foresman – Addison Wesley, 1999)
- Calculus I AP with the TI-89 Activities
- Exponential Growth Lab by Jim Rahn
- Modeling Exponential Growth (MM) Lab by Jim Rahn

Unit of Study

Unit Title: Applications of Definite Integrals

Essential Questions of the Unit:

1. How can an integral be used to solve problems?
2. How is an integral related to the net change made over time?
3. How can integrals be applied to finding bounded areas and generated volume?

Assessments:

1. Students will be given daily reading assignments and written assignments to monitor their understanding of the prerequisites of calculus.
2. Periodic quizzes will be given to help students assess their immediate understanding of new ideas.
3. An end of the unit take home exam will be given upon the completion of the study of the integral and their applications.

Content:

1. Linear Motion Revisited	2. Consumption over time
3. Net change from Data	4. Area Between Curves
5. Area enclosed by intersecting curves	6. Boundaries with Changing Functions
7. Integrating with respect to y	8. Saving Time with Geometry Formulas
9. Volume as an Integral	10. Square Cross Sections
11. Circular Cross Sections	12. Cylindrical Shells
13. Other Cross Sections	14.

Skills:

1. To be able to solve problems in which a rate is integrated to find the net change over time in a variety of applications.
2. To be able to use integration to calculate area of regions in a plane.
3. To be able to use integration (by slices or shells) to calculate volumes of solids.
4. To be able to use integration to calculate surface areas of solids of revolutions.

Purpose / Rationale of the Unit:

Up to this point in each student's mathematics experience they have not had any means of generating area of irregularly shaped figures or the volume of a solid that have irregular shapes. This unit provides students with a means to complete both of these tasks.

New Jersey Core Curriculum Content Standards:

- Standard 4.7:
  All Students Will Develop Spatial Sense And An Ability To Use Geometric Properties And Relationships To Solve Problems In Mathematics And In Everyday Life
- Standard 4.13:
  All Students Will Develop An Understanding Of Algebraic Concepts And Processes And Will Use Them To Represent And Analyze Relationships Among Variable Quantities And To Solve Problems
- Standard 4.15:
  All Students Will Develop An Understanding Of The Conceptual Building Blocks Of Calculus And Will Use Them To Model And Analyze Natural Phenomena
- Standard 4.16:
  All Students Will Demonstrate High Levels Of Mathematical Thought Through Experiences Which Extend Beyond Traditional Computation, Algebra, And Geometry

Time Frame of Unit: 16 days

Instructional Activities:

1. Students will read and study material presented in course textbook and then challenged with questions about their reading through examples.
2. Homework assignments will be discussed to insure a good understanding of the applications of a definite integral.
3. The graphing calculator will be integrated into various exercises to help the student visualize the problems.
4. Students will be asked to make conclusions after working through explorations scattered throughout the unit.
5. Students will work on several exercises throughout the unit cooperatively to enhance their understanding of how to use integration in solving problems.

Materials and Resources:

- Calculus by Finney, Demana, Waits, and Kennedy (Scott Foresman – Addison Wesley, 1999)
- Calculus I AP with the TI-89 Activities
- Understanding Volume of Revolution Project by Jim Rahn
- Rate of Change Lab by Jim Rahn
- Bundt Cake Lab by Jim Rahn
- Area of a Nike Symbol Lab by Jim Rahn
- Accumulation Function Lab by Jim Rahn
- Approximating Area with Rectangles Lab by Jim Rahn

Unit of Study

Unit Title: AP Test Preparation

Essential Questions of the Unit:

1. How do all the ideas that we studied this year fit together?

Assessments:

1. Students will be given the two most recently released AP tests as practice. They results weill be used to help students correct weaknesses in their learning.
2. Free-Response Questions from the past 10 years will be given and graded. Students will learn how the nine points are assigned for each of these questions.
3. Additional free-response and multiple choice questions will be assigned as needed.

Content:

Topics will be selected from the College Board Acorn Booklet and from the two most recently released AP tests.

Skills:

To be able to answer any question covered during the year.

Purpose / Rationale of the Unit:

Students who are familiar with the type of question and the scoring procedures on an AP test usually score higher grades when they take the AP test in the spring.

New Jersey Core Curriculum Content Standards:

- Standard 4.7:
  All Students Will Develop Spatial Sense And An Ability To Use Geometric Properties And Relationships To Solve Problems In Mathematics And In Everyday Life
- Standard 4.13:
  All Students Will Develop An Understanding Of Algebraic Concepts And Processes And Will Use Them To Represent And Analyze Relationships Among Variable Quantities And To Solve Problems
- Standard 4.15:
  All Students Will Develop An Understanding Of The Conceptual Building Blocks Of Calculus And Will Use Them To Model And Analyze Natural Phenomena

Time Frame of Unit: 20 days

Instructional Activities:

1. Students will complete two complete AP tests and ask questions on items they do not understand.
2. Students will work together in groups to find out the type of error a student must make to arrive at any of the multiple choice answers.
3. Homework assignments will be discussed to insure a good understanding of all topics.
4. The graphing calculator will be integrated into various exercises to help the student visualize the problems.

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Materials and Resources:

- Calculus by Finney, Demana, Waits, and Kennedy (Scott Foresman – Addison Wesley, 1999)
- Calculus I AP with the TI-89 Activities
- Sally Fishback's Calculus AP Tests
- Recently published AP tests