Boonton School District

Course Title:	Calculus Honors	**Grade Level(s):**	12		
Curriculum Area / Level:	Math / Honors	**Credits:**	**5**		
Course prerequisites and/or co-requisites:	Geometry, Algebra II, Pre-Calculus/ EF Calculus Honors				
Course Description:	This course is intended for students from the honors group who have a knowledge of college preparatory mathematics including Algebra, Geometry, Trigonometry and Elementary Functions. This course, comparable to a first semester course in college, consists of a full academic year of work in calculus and related topics. This course has similar rigour to the AP Calculus Course, without the time restraint of the AP Exam in May.				
Created by:	Michael London	**Date:**	August 2016	**BOE Approval:**	9/26/16
District Equity Statement:	As required by state law, it is the policy of Boonton School District not to discriminate on the basis of race, color, creed, religion, sex, ancestry, national origin, social or economic status, pregnancy, or physical handicap in its educational programs or activities and to maintain a learning environment that is free from sexual harassment. Courses of study and instructional materials shall be designed and selected in order to eliminate discrimination and promote understanding, sex equity, and mutual respect among people. No course offering, including but not limited to physical education, health, technology education, vocational, home economics, music and adult education, shall be limited on the basis of race, color, creed, religion, sex, ancestry, national origin, social or economic status, pregnancy, or physical handicap. Furthermore, there shall be no discrimination against students as to any educational activity or program because of pregnancy, childbirth, pregnancy-related disabilities, actual or potential parenthood, or family or marital status. If a student requests to be excluded or a physician certifies that such is necessary for her physical, mental, or emotional well-being, she must be provided with adequate and timely opportunity for instruction to continue or make up her schoolwork without prejudice or penalty.				

Division of Umbrella & Mini Units	
Umbrella Unit 1 Topic / Name: **Functions, Graphs, and Limits**	**Mini Unit(s)** ***(Add to the list of mini units as necessary)*** **1A. Functions and Limits** **1B. Continuity** **1C. An Introduction to Derivatives**
Umbrella Unit 2 Topic / Name: **Differentiation and its Application**	**Mini Unit(s)** ***(Add to the list of mini units as necessary)*** **2A. Derivatives** **2B. Derivative Applications** **2C. Derivative Applications to Real-Life Situations**
Umbrella Unit 3 Topic / Name: **Integration and Differential Equations**	**Mini Unit(s)** ***(Add to the list of mini units as necessary)*** **3A. Definite Integrals** **3B. Differential Equations and Modeling**
Umbrella Unit 4 Topic / Name: **Integral Applications**	**Mini Unit(s)** ***(Add to the list of mini units as necessary)*** **4A. Area and Accumulation** **4B. Volume**

UMBRELLA UNIT 1	
Title:	Functions, Graphs, and Limits
Duration:	44 days
Essential Questions:	How is a limit determined? How do limits guarantee the continuity of a function? When do limits fail to exist? What is the difference between determining a limit and evaluating a limit as specific point?
Summative Assessments: **(Assessment at the end the learning period)**	Sample AP Section Tests Quizzes
Formative Assessments: **(Ongoing assessments during the learning period)**	Homework Assignments Lab Quizzes Tests
Differentiation:	Labs are available for students better with hands on learning Alternate assignments are available for each section for students ahead of the curve
TECHNOLOGY STANDARD (STANDARD 8)	
CPI #	**CUMULATIVE PROGRESS INDICATOR (CPI)**
8.1.12.A.1	**Construct a spreadsheet, enter data, and use mathematical or logical functions to manipulate data, generate charts and graphs, and interpret the results**
8.1.12.A.2	**Produce and edit a multi-page document for a commercial or professional audience using desktop publishing and/or graphics software.**

21ST CENTURY LIFE AND CAREER (STANDARD 9)	
CPI #	**CUMULATIVE PROGRESS INDICATOR (CPI)**
9.1.12.A.1	**Apply critical thinking and problem-solving strategies during structured learning experiences.**
9.1.12.B.1	**Present resources and data in a format that effectively communicates the meaning of the data and its implications for solving problems, using multiple perspectives**

MINI UNIT 1A		
Title:	**Functions and Limits**	
Duration:	**14 days**	
Overview:	**Students will become acquainted with the relationship between algebra/geometry and the development of Calculus. Evaluating limits both analytically and graphically is a major area of the unit and will be emphasized. Students will use the TI-89 calculator to help develop the intuitive feel of limits and graph behavior. From this unit students will have a complete understanding of limits and how they are used.**	
Essential Outcomes - Upon completion of this course students will know (declarative):		**Alignment to Standards**
The definition of a limit		**F.IF.A.1**
Various methods to evaluate a limit		**F.IF.B.4**
How to identify horizontal and vertical asymptotes		**F.BF.B.4**
How to evaluate limits with infinity		**F.BF.B.4**
How to develop a formal definition of the derivative using the limit of the slope of a line tangent to a curve		**F.IF.B.6**

Essential Outcomes - Upon completion of this course students will be able to (procedural):	**Alignment to Standards**
Evaluate a limit	**F.IF.B.4**
Identify horizontal and vertical asymptotes	**F.BF.B.4**
Develop a formal definition for the derivative using limits	**F.IF.B.6**
Essential Outcomes - Upon completion of this course students will understand (conceptual):	**Alignment to Standards**
The formal definition of a limit	**F.IF.B.4**
Functions have asymptotes when they do not reach the value of its limit as x or y approach infinity	**F.BF.B.4**
The derivative of a function is the slope of the line tangent to the curve	**F.IF.B.6**
Resources Mini Unit 1A:	Textbook, jamesrahn.com, TI-89 Calculator, Interactive Whiteboard

MINI UNIT 1B	
Title:	**Continuity**
Duration:	**12 days**
Overview:	**Students will master the concept of continuity. They will use the definition of the limit to determine continuity. Students will be able to redefine piece-wise functions in order to guarantee continuity.**

Essential Outcomes - Upon completion of this course students will know (declarative):	**Alignment to Standards**
The difference between a continuous and discontinuous function	**F.IF.A.1 F.IF.A.2 F.LE.A.1.a F.LE.A.1.b**
The Intermediate Value Theorem	**F.IF.B.6**
How to make a discontinuous piece-wise defined function a continuous function	**F.IF.C.7.b**
Average Rates of Change	**F.IF.6 F.LE.A.1.b F.TF.C.8 F.TF.C.9**
Essential Outcomes - Upon completion of this course students will be able to (procedural):	**Alignment to Standards**
Determine if a function is continuous over an open or closed interval	**F.IF.A.1 F.IF.A.2 F.LE.A.1.a F.LE.A.1.b**

Determine the range of a slope over a closed interval using the Intermediate Value Theorem	**F.IF.B.6**
Redefine a piece-wise function to ensure continuity	**F.IF.C.7.b**
Determine the average rate of change of a function	**F.IF.6** **F.LE.A.1.b** **F.TF.C.8** **F.TF.C.9**
Essential Outcomes - Upon completion of this course students will understand (conceptual):	**Alignment to Standards**
The difference between continuous and discontinuous functions using left and right sided limits	**F.IF.A.1** **F.IF.A.2** **F.LE.A.1.a** **F.LE.A.1.b**
The range of slopes of a curve over an interval determined by slope created by the endpoints	**F.IF.B.6**
How to create a continuous function given a discontinuous piece-wise defined function	**F.IF.C.7.b**
How rates of change relate directly to the derivative as a real-life application as they relate to position, velocity, and acceleration	**F.IF.6** **F.LE.A.1.b** **F.TF.C.8** **F.TF.C.9**
What it means in the real world if a function is continuous or discontinuous	**F.IF.C.7.b**
Resources Mini Unit 1B:	Textbook, jamesrahn.com, TI-89 Calculator, Interactive Whiteboard

MINI UNIT 1C		
Title:	**An Introduction to Derivatives**	
Duration:	**18 days**	
Overview:	**This mini unit will introduce students to the derivative. They will use the definition of the derivative using limits to determine the slope of tangent line to curve. Students will learn the rules to find derivatives analytically, and to identify the graph of a derivative given the original function.**	
Essential Outcomes - Upon completion of this course students will know (declarative):		**Alignment to Standards**
The definition of the derivative using limits		**F.LE.A.1.a** **F.IF.A.1**
How the graph of a function relates to the graph of the function's derivative		**F.IF.C.7.a** **F.IF.C.8.a** **F.IF.C.8.b**
The difference between a differentiable and non-differentiable function		**F.IF.C.7.d**
The rules of differentiation		**F.BF.B.3**
How to determine rate of change of a function using the derivative rules		**F.IF.6** **F.LE.A.1.b** **F.TF.C.8** **F.TF.C.9**
How derivatives apply to physics and motion along a line		**F.IF.B.5** **F.BF.A.1.b**

Essential Outcomes - Upon completion of this course students will be able to (procedural):	Alignment to Standards
Determine the derivative of a function by using the formal definition of the derivative	F.LE.A.1.a F.IF.A.1
Create the graph of the derivative of a function given the original function	F.IF.C.7.a F.IF.C.8.a F.IF.C.8.b
Determine if a function is differentiable	F.IF.C.7.d
Evaluate a derivative using the rules including power, product, and quotient rules	F.BF.B.3
Evaluate the rate of change of a function	F.IF.6 F.LE.A.1.b F.TF.C.8 F.TF.C.9
Determine velocity and acceleration given the position function	F.IF.B.5 F.BF.A.1.b
Essential Outcomes - Upon completion of this course students will understand (conceptual):	**Alignment to Standards**
The relationship of limits and derivatives and how to derive the formal definition of the derivative	F.LE.A.1.a F.IF.A.1
The relationship between the graphs of the original function and the derivative	F.IF.C.7.a F.IF.C.8.a F.IF.C.8.b
What it means to be differentiable	F.IF.C.7.d
The rules of differentiation	F.BF.B.3

The relationship between position, velocity, and acceleration	**F.IF.B.5** **F.BF.A.1.b**

Resources Mini Unit 1C:	Textbook, jamesrahn.com, TI-89 Calculator, Interactive Whiteboard

UMBRELLA UNIT 2	
Title:	Differentiation and its Application
Duration:	38 days
Essential Questions:	What does the derivative tell us? How can the derivative be used to solve optimization problems? How are rates of change properties used to solve real-life problems?
Summative Assessments: **(Assessment at the end the learning period)**	Sample AP Section Tests Quizzes
Formative Assessments: **(Ongoing assessments during the learning period)**	Homework Assignments Lab Quizzes Tests
Differentiation:	Labs are available for students better with hands on learning Alternate assignments are available for each section for students ahead of the curve
TECHNOLOGY STANDARD (STANDARD 8)	
CPI #	**CUMULATIVE PROGRESS INDICATOR (CPI)**
8.1.12.A.1	**Construct a spreadsheet, enter data, and use mathematical or logical functions to manipulate data, generate charts and graphs, and interpret the results**
21ST CENTURY LIFE AND CAREER (STANDARD 9)	
CPI #	**CUMULATIVE PROGRESS INDICATOR (CPI)**
9.1.12.A.1	**Apply critical thinking and problem-solving strategies during structured learning experiences.**

MINI UNIT 2A	
Title:	**Derivatives**
Duration:	**18 days**
Overview:	**This section focuses on expanding the students' understanding and use of the derivative. It includes the Chain Rule, Implicit Differentiation, as well as derivatives of the Inverse, Exponentials, and Logarithms. Students will get their first introduction to derivatives with Trigonometry**

Essential Outcomes - Upon completion of this course students will know (declarative):	**Alignment to Standards**
How and when to evaluate a derivative using The Chain Rule analytically as well as using graphs and tables	**F.IF.C.9 F.BF.A.1.c F.BF.B.4.b**
To evaluate a derivative using Implicit Differentiation by taking the derivative with respect to another variable	**F.IF.C.9 F.BF.A.1.c F.BF.B.4.b**
The relationship between a function and its inverse	**F.BF.B.4.b F.BF.B.4.c**
How to find the derivative of a function's inverse	**F.BF.B.4.b F.BF.B.4.c**
How to differentiate exponential functions and logarithms	**F.IF.C.7.e F.BF.B.5 F.LE.A.4**
Essential Outcomes - Upon completion of this course students will be able to (procedural):	**Alignment to Standards**
Evaluate the derivative of Composite Functions using	**F.IF.C.9**

the chain rule	**F.BF.A.1.c** **F.BF.B.4.b**
Use the Chain Rule to derive a rule for Implicit Differentiation and apply the rule	**F.IF.C.9** **F.BF.A.1.c** **F.BF.B.4.b**
Evaluate the derivative of an Inverse Function	**F.BF.B.4.b** **F.BF.B.4.c**
Evaluate the derivative of an Exponential or Logarithmic Function	**F.IF.C.7.e** **F.BF.B.5** **F.LE.A.4**
Essential Outcomes - Upon completion of this course students will understand (conceptual):	**Alignment to Standards**
When to use the various methods of differentiation (Chain Rule, Implicit, Power, Product, Quotient)	**F.IF.C.9** **F.BF.A.1.c** **F.BF.B.4.b**
The relationship between a function, its inverse, and their derivatives	**F.BF.B.4.b** **F.BF.B.4.c**
How to derive rules (such as chain and quotient) for differentiating Exponential and Logarithmic Functions	**F.IF.C.7.e** **F.BF.B.5** **F.LE.A.4**
Resources Mini Unit 2A:	Textbook, jamesrahn.com, TI-89 Calculator, Interactive Whiteboard

MINI UNIT 2B	
Title:	**Derivative Applications**
Duration:	**12 days**
Overview:	**Students will discover some of the many applications of the derivative. Graph relationships between f, f', and f" are a critical area in this unit (graph analysis). Students are taught a 'process' for problems that involve rates of change and motion – functionalize, differentiate, test for extrema, and solve. Students are taught how to approach a particular problem in calculus, and use the calculator as a tool in the solution process.**

Essential Outcomes - Upon completion of this course students will know (declarative):	**Alignment to Standards**
The relationship between increasing/decreasing and the first derivative of a function is determined by the sign of the derivative	**F.IF.B.6 F.IF.C.7.a F.IF.C.8.a**
A "critical value" is anywhere that the derivative equals zero or does not exist	**F.IF.C.7.a**
An extreme value is the highest and lowest point on the graph in a given interval	**F.IF.C.7.a**
To find extreme values by setting the first derivative equal to zero and identifying critical values	**F.IF.C.7.a**
The relationship between the graphs of f, f', and f"	**F.IF.B.6 F.IF.C.7.a F.IF.C.8.a**
Essential Outcomes - Upon completion of this course students will be able to (procedural):	**Alignment to Standards**
Determine where a graph is increasing or decreasing	**F.IF.B.6**

based its derivative	**F.IF.C.7.a** **F.IF.C.8.a**
Determine where critical values occur and whether that value is a maximum or minimum	**F.IF.C.7.a**
Evaluate the extreme values of a function using critical values	**F.IF.C.7.a**
Graph a function based on the first and second derivatives	**F.IF.B.6** **F.IF.C.7.a** **F.IF.C.8.a**
Essential Outcomes - Upon completion of this course students will understand (conceptual):	**Alignment to Standards**
A function increases/decreases based on the sign of the first derivative	**F.IF.B.6** **F.IF.C.7.a** **F.IF.C.8.a**
Critical values occur where the first derivative is equal to zero or undefined. They can also occur at the endpoints of a closed interval. The shape of the graph is determined by its critical values.	**F.IF.C.7.a**
Extreme values occur where the first derivative changes signs or at the endpoints of a closed interval	**F.IF.B.6** **F.IF.C.7.a** **F.IF.C.8.a**
Resources Mini Unit 2B:	Textbook, jamesrahn.com, TI-89 Calculator, Interactive Whiteboard

MINI UNIT 2C	
Title:	**Derivative Applications to Real-Life Situations**
Duration:	**8 days**
Overview:	**This section focuses on applying derivatives to concepts in real-life situations. Students will learn how to make linear approximations using the derivative. Students will also solve problems involving distance, area, and volume.**

Essential Outcomes - Upon completion of this course students will know (declarative):	Alignment to Standards
How to use the derivative to approximate the value of a function where the slope is unknown at that specific point	F.IF.C.8.a F.IF.B.6
The Pythagorean Theorem can be used to determine the rate of change involving distance by taking the derivative with respect to different variables	F.IF.C.8.a F.IF.B.6 F.TF.C.8
The relationship between area, surface area, and volume is found by using the derivative	F.IF.6 F.LE.A.1.b F.TF.C.8 F.TF.C.9
How to determine the accumulation given rates of entry and exit by solving systems of equations with derivatives	F.IF.6 F.LE.A.1.b F.TF.C.8 F.TF.C.9
Essential Outcomes - Upon completion of this course students will be able to (procedural):	**Alignment to Standards**
Approximate the value of a function by using the point-slope form of a line and the derivative as the	F.IF.C.8.a F.IF.B.6

slope	
Determine the rate of change between two moving objects heading in different directions	**F.IF.6 F.LE.A.1.b F.TF.C.8 F.TF.C.9**
Evaluate surface area and volume of an object with changing dimensions	**F.IF.6 F.LE.A.1.b F.TF.C.8 F.TF.C.9**
Determine the accumulation at any given time by relating a function of entry and exit	**F.IF.6 F.LE.A.1.b F.TF.C.8 F.TF.C.9**
Essential Outcomes - Upon completion of this course students will understand (conceptual):	**Alignment to Standards**
By having a derivative and two points a linear approximation of a value can be determined	**F.IF.C.8.a F.IF.B.6**
The Pythagorean Theorem and Implicit Differentiation is used to determine rate of change of distance between two objects moving in different directions	**F.IF.6 F.LE.A.1.b F.TF.C.8 F.TF.C.9**
Given rate of change a dimension, area, surface area, and volume can be determined	**F.IF.6 F.LE.A.1.b F.TF.C.8 F.TF.C.9**
Given rate of change of entry and exit, accumulation can be determined at any point	**F.IF.6 F.LE.A.1.b**

	F.TF.C.8 **F.TF.C.9**
Resources Mini Unit 2C:	Textbook, jamesrahn.com, TI-89 Calculator, Interactive Whiteboard

UMBRELLA UNIT 3	
Title:	Integration and Differential Equations
Duration:	32 days
Essential Questions:	What is a Riemann Sum? What is an integral? What is the difference between a definite and indefinite integral? How are integrals used to find: - Average values? - Accumulation? - Position, Velocity, and Acceleration? What methods are used to evaluate integrals? What is the relationship between the antiderivative and the derivative?
Summative Assessments: **(Assessment at the end the learning period)**	AP Exam Sections Quizzes Tests
Formative Assessments: **(Ongoing assessments during the learning period)**	Homework assignments Quizzes Tests Labs
Differentiation:	Labs are available for students better with hands on learning Alternate assignments are available for each section for students ahead of the curve

TECHNOLOGY STANDARD (STANDARD 8)	
CPI #	**CUMULATIVE PROGRESS INDICATOR (CPI)**
8.1.12.A.1	**Construct a spreadsheet, enter data, and use mathematical or logical functions to manipulate data, generate charts and graphs, and interpret the results**
21ST CENTURY LIFE AND CAREER (STANDARD 9)	
CPI #	**CUMULATIVE PROGRESS INDICATOR (CPI)**
9.1.12.A.1	**Apply critical thinking and problem-solving strategies during structured learning experiences.**

MINI UNIT 3A		
Title:	**Definite Integrals**	
Duration:	**17 days**	
Overview:	**This unit will supply the students with the capability of integrating a variety of function types. It is necessary for them to integrate by hand as well as with a calculator for the exam. The relationship between the Riemann Sums and the definite integral is a major point of interest in the unit. The Trapezoidal Rule helps to demonstrate the idea of the definite integral representing summation.**	
Essential Outcomes - Upon completion of this course students will know (declarative):		**Alignment to Standards**
That an integral is the area under a curve bounded by the x-axis		**F.IF.B.4**
Riemann Sums are estimates for the definite integral		**F.IF.B.4**
Antiderivative Rules		**F.IF.B.4**
The Fundamental Theorem of Calculus		**F.IF.B.4**

The Trapezoidal Rule	**F.IF.B.4**
Essential Outcomes - Upon completion of this course students will be able to (procedural):	**Alignment to Standards**
Evaluate an integral by using Riemann Sums	**F.IF.B.4**
Evaluate an integral using the antiderivative	**F.IF.B.4**
Apply the Fundamental Theorem of Calculus to evaluate functions defined as the integral of derivatives	**F.IF.B.4**
Evaluate the area under a curve using the Trapezoidal Rule	**F.IF.B.4**
	F.IF.B.4
Essential Outcomes - Upon completion of this course students will understand (conceptual):	**Alignment to Standards**
The similarity and differences between the methods used to determine the area under a curve (Riemann Sum, Trapezoidal Rule, Antiderivatives)	**F.IF.B.4**
When to use a given method (Riemann Sum, Trapezoidal Rule, Antiderivatives) to solve an integral	**F.IF.B.4**
What an integral represents	**F.IF.B.4**
Resources Mini Unit 3A:	Textbook, jamesrahn.com, TI-89 Calculator, Interactive Whiteboard

MINI UNIT 3B	
Title:	**Differential Equations and Modeling**
Duration:	**15 days**
Overview:	**Students will learn to use the method of U-Substitution to solve more difficult problems involving integration. Students will spend time investigating integration with Trigonometry and Logarithms. This unit also introduces students to slope fields.**

Essential Outcomes - Upon completion of this course students will know (declarative):	Alignment to Standards
U-Substitution as a method of integration	F.IF.C.9 F.BF.A.1.c F.BF.B.4.b
Changing limits within an integral can simplify the problem	F.IF.C.9 F.BF.A.1.c F.BF.B.4.b
Separable differential equations are solved using integration	F.IF.C.9 F.BF.A.1.c F.BF.B.4.b
Slope Fields represent the rate of change of function with a changing constant of integration	F.IF.C.7.d
Essential Outcomes - Upon completion of this course students will be able to (procedural):	**Alignment to Standards**
Evaluate an integral using U-Substitution	F.IF.C.9 F.BF.A.1.c F.BF.B.4.b
Change the limits of an integral when using	F.IF.C.9

U-Substitution to simplify a problem	**F.BF.A.1.c** **F.BF.B.4.b**
Solve separable differential equations with integration	**F.IF.C.7.d**
Create a slope field with and without a calculator	**F.IF.C.7.d**
Essential Outcomes - Upon completion of this course students will understand (conceptual):	**Alignment to Standards**
The relationship between U-Substitution and the Chain Rule	**F.IF.C.9** **F.BF.A.1.c** **F.BF.B.4.b**
When it is applicable to change limits within an integral	**F.IF.C.9** **F.BF.A.1.c** **F.BF.B.4.b**
The relationship between implicit differentiation and solving differential equations	**F.IF.C.9** **F.BF.A.1.c** **F.BF.B.4.b**
The properties of slope fields	**F.IF.C.7.d**
Resources Mini Unit 3B:	Textbook, jamesrahn.com, TI-89 Calculator, Interactive Whiteboard

UMBRELLA UNIT 4	
Title:	Integral Applications
Duration:	22 days
Essential Questions:	How is integration used to determine accumulation? How is area between two curves evaluated? What is the difference between area along the x-axis and y-axis? How is a three dimensional shape created on the xy plane? What different methods are used to determine volume? How is volume found using known cross sections?
Summative Assessments: **(Assessment at the end the learning period)**	A Final Exam covering all concepts covered during the duration of the course AP Exam Sections Tests Quizzes
Formative Assessments: **(Ongoing assessments during the learning period)**	Assignments Quizes Tests Labs
Differentiation:	Labs are available for students better with hands on learning Alternate assignments are available for each section for students ahead of the curve

TECHNOLOGY STANDARD (STANDARD 8)	
CPI #	**CUMULATIVE PROGRESS INDICATOR (CPI)**
8.1.12.A.1	**Construct a spreadsheet, enter data, and use mathematical or logical functions to manipulate data, generate charts and graphs, and interpret the results**
21ST CENTURY LIFE AND CAREER (STANDARD 9)	
CPI #	**CUMULATIVE PROGRESS INDICATOR (CPI)**
9.1.12.A.1	**Apply critical thinking and problem-solving strategies during structured learning experiences.**

MINI UNIT 4A		
Title:	**Area and Accumulation**	
Duration:	**11 days**	
Overview:	**This section focuses on determining the area between two curves. Similar strategies are used as when finding area between a curve and either axis. Students must determine which axis should be referenced in each situation.**	
Essential Outcomes - Upon completion of this course students will know (declarative):		**Alignment to Standards**
To find the area between two curves along the x-axis both functions must be in terms of x		**F.IF.C.9 F.BF.A.1.c F.BF.B.4.b**
To find the area between two curves along the y-axis both functions must be in terms of y		**F.IF.C.9 F.BF.A.1.c F.BF.B.4.b**
To find accumulation or quantity given different		**F.IF.6**

specifics	**F.LE.A.1.b** **F.TF.C.8** **F.TF.C.9**
Essential Outcomes - Upon completion of this course students will be able to (procedural):	**Alignment to Standards**
Find the area between two curves along the x-axis (or y-axis) by taking the interval of the top curve minus the integral of the bottom curve	**F.IF.C.9** **F.BF.A.1.c** **F.BF.B.4.b**
To identify the correct method to use when finding accumulation determined by the information given	**F.IF.6** **F.LE.A.1.b** **F.TF.C.8** **F.TF.C.9**
Essential Outcomes - Upon completion of this course students will understand (conceptual):	**Alignment to Standards**
How to set up an integral according to the correct axis depending on the functions given and which method would be best	**F.IF.C.9** **F.BF.A.1.c** **F.BF.B.4.b**
The correct method to use to solve a problem involving accumulation determined by which derivative or rate of change is given	**F.IF.6** **F.LE.A.1.b** **F.TF.C.8** **F.TF.C.9**
Resources Mini Unit 4A:	Textbook, jamesrahn.com, TI-89 Calculator, Interactive Whiteboard

MINI UNIT 4B	
Title:	**Volume**
Duration:	**11 days**
Overview:	**This section focuses on evaluating the volume of solids of revolution. Students will use integration to find the volume of a figure created by revolving the area between two curves about the x-axis, y-axis, or any other linear function. Students will also be able to evaluate the volume with known cross sections including squares, rectangles, and triangles.**

Essential Outcomes - Upon completion of this course students will know (declarative):	**Alignment to Standards**
The Disk Method to evaluate the volume of a solid of revolution	**F.IF.B.4**
The Disk Method to evaluate the volume of a solid of revolution	**F.IF.B.4**
When to use each method when finding volume	**F.IF.B.4**
How to find volume when the area is rotated about a line other than an axis	**F.IF.B.4**
Essential Outcomes - Upon completion of this course students will be able to (procedural):	**Alignment to Standards**
Evaluate the volume of a solid of revolution using the Disk Method	**F.IF.B.4**
Evaluate the volume of a solid of revolution using the Washer Method	**F.IF.B.4**
Determine which method is appropriate given the situation	**F.IF.B.4**

Evaluate the volume with a known cross section	**F.IF.B.4**
Essential Outcomes - Upon completion of this course students will understand (conceptual):	**Alignment to Standards**
How and when to use the disk versus washer method	**F.IF.B.4**
How to find the volume of a solid of revolution when it is not rotated about either axis	**F.IF.B.4**
The differences and similarities between the disk and washer methods and the reasons for these differences (position of the graph in reference to the axis)	**F.IF.B.4**
How the properties of Geometry relate to find the volume with known cross sections	**F.IF.B.4**
Resources Mini Unit 4B:	Textbook, jamesrahn.com, TI-89 Calculator, Interactive Whiteboard

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