Curriculum Planning Document – Math			
Content Area/Grade Level: Math/High School – Advanced Calculus (Semester A and B)			
Course Description: This course grounds the study of calculus in real-world scenarios and integrates it with the four STEM disciplines. The first semester covers functions, limits, derivatives and the application of derivatives. The course goes on to cover differentiation and anti-differentiation, applications of integration, inverse functions, and techniques of integration.			
	Educational Delivery Methodologies	**Evidence of Mastery**	**Comments**
Advanced Calculus (Scope and Sequence)			
Semester A Unit 1 - Functions/Prerequisite for Calculus What is a Function? - Describe and graph basic functions. • Explore four ways to represent a function; numerically (table of values), algebraically (explicit formula), verbally (description in words) & visually (graph) • Evaluate a function at a given value • Determine the domain and range of a function and state each using proper interval notation • Demonstrate the use of the vertical line test to show that an equation or graph represents a function Linear Functions - Demonstrate graphing, manipulation and applications of linear	The Edmentum LMS (PLATO Courseware) as detailed in the narrative, includes a diverse set of instructional methodologies integrated into each course. These instructional methods include: computer assisted learning systems, virtual classrooms, virtual labs, electronic field trips, electronic mail and messaging, virtual tutoring, online help desk, a wide array of formative assessments and non-computer activities. The common design elements and activities combined with a thorough initial orientation video lecture support a student's quick understanding of the delivery system. This immediate	Mastery for each course will be based on the student meeting the prescribed Performance, Participation, and Progress requirements. The program is designed to foster high expectations for staff and students. The goal for all students is to meet 100% of the expected progress and 100% of the expected weekly participation. The desired performance goal for all students is to attain a score of 100% on all assignments. The minimum that will be accepted on each assignment and assessment is 70%. *<u>Assessment and Testing</u>*	Continued Throughout Course

functions. • Calculate and interpret the slope of a linear function and relate it to a real-life applications • Review the relationship between perpendicular and parallel lines • Find the point of intersection of two linear equations Types of Functions - Categorize and describe functions. • Explore categories of functions while noting format of the equation as well as their graph: linear, polynomial, power, rational, algebraic, inverse, exponential, logarithmic • Explore piecewise functions and a specific example of a piecewise function, the absolute value function • Explore descriptors of functions such as even, odd, increasing, decreasing, symmetry, polynomial, degree, quadratic and cubic • Review trigonometric angle measurement • Calculate missing measurements given lengths and angles of a triangle • Graph trig functions • Use trigonometric identities to solve and simplify trigonometric	understanding enables a student to focus on the content right from the beginning of the first lesson. Each course utilizes a variety of methods and has the flexibility to allow teachers to modify the program to suit individual student learning needs. The Edmentum LMS (PLATO Courseware) enables the teacher to employ numerous educational delivery options for each online course. The ability to modify delivery methods empowers teachers to efficiently and effectively support differentiation of instruction, customized assessments, and supplementation of course material for different learning styles. Providing online students a choice in how they absorb content is considered a key to supporting different learning styles. The primary delivery method for the proposed program's content, is web-based	Best practices in assessment and testing call for a variety of activities to evaluate student learning. Multiple data points present a more accurate evaluation of student strengths and needs. Formative and Summative Assessments contained in the web-delivered content, which include authentic learning and objective assessments are used to show mastery: • Unit pretests (typically designed for credit recovery use) • Mastery tests • Lesson Activities • Unit Activities • Online Threaded Discussions • Unit Post-Tests • End-of-Semester Exam <u>Authentic Learning Assessments</u>: Of the assessment tools available in this course, three are	

expressions Trigonometric Functions - Review trigonometric identities, functions and their graphs. • Review trigonometric angle measurement • Calculate missing measurements given lengths and angles of a triangle • Graph trig functions • Use trigonometric identities to solve and simplify trigonometric expressions Graphing Methods - Explore the graphing of functions using different methods. • Find the intercepts of a function if they exist • Use the descriptors of a function to assist in visualizing the graph of a function • Graph different categories of functions on a graphing calculator and/or technology • Graph different categories of functions by using pencil and graph paper Transformations - Graph new functions made from old functions. • Explore transformation of functions by noting when their	online delivery. Based on needs identified by teacher monitoring, formative and summative assessment, or student request, the delivery method can be modified in numerous ways. <u>Flexible deliverability</u> All online materials are printable. The interface and font of the content can be adjusted to minimize the amount of ink used in printing. eNotes: In lieu of paper notes, the students have the option to take eNotes while listening to & interacting with the tutorials or while studying the online readings and content. These notes can be made available at the end of lesson or course assessment at the discretion of the teacher and the individual student. Secure internal messaging system: provides the option for synchronous or asynchronous support of student learning.	designed specifically to address higher-level thinking skills and operations: Lesson activities, unit activities, and discussions. These authentic learning activities allow students to develop deep understanding and provide data for the teacher to assess knowledge development. They also provide a tool for assessing identified Common Core mathematical practices, inquiry skills, STEM skills, and 21st century skills. The following comments address their use for assessment. • Lesson Activities immerse the student into one or more in-depth problems that center on developing a deep understanding of the learning objective. All Lesson Activities in this course are self-checked	

graphs are moved up, down, left, right, stretched, compressed and reflected • Explore combinations of functions graphically Unit 2 - Limits Tangent Lines and Velocity - Examine the tangent problem and relate it to instantaneous velocity. • Understand the tangent line problem graphically and how it relates to a rate of change • View the tangent line approaching from the left and right sides • Relate the tangent problem to instantaneous velocity • Calculate the slope and instantaneous velocity using data from a table or a function • Graphing calculator activity o Use the graphing tool (or your personal calculator) to see what happens to the secant when you reduce the interval between points P and Q: o Enter the function f(x) = 0.25*(x^2). o Enter 2 (the x-coordinate of P) as the value of the tangent at x. Enter 4 (the x-coordinate of Q) as the value of the secant at x. Then click New Function to generate the	Teacher online office hours: Teachers provide four hours of online synchronous office hours. Additional synchronous time can be requested by students as needed. Phone communication as required. Teachers will have access to phone numbers and refer students and parents to a phone conference as required. Supplemental assignments: The content can be delivered by all lessons or one lesson at a time. Teachers may determine that an alternative assignment that covers the same objective may be appropriate. These alternative assignments will be approved by the administration and delivered electronically to the student. Supplemental resource links: Students may seek out additional information	by the student; however, it is possible to submit this work for teacher grading on paper, by email, or by creating a drop box activity in the course learning path. • Unit Activities are similar to Lesson Activities, but more time intensive and require a more integrative understanding of the unit's objectives. Unit activities are teacher graded and submitted through the drop box. These activities allow the instructor to score work on a scale of 0 to 100. A 10-point suggested rubric is provided to both the	

graph. o Reduce the value of the x-coordinate of Q so it is closer to the value of the x-coordinate of P. Note how the graph changes. o What can you conclude from this activity? What Are Limits? - Examine limits using both a numerical and graphical approach. • Understand the concept of limits as seen graphed or stated as a function • Use the definition of the limit to find the limit of a function • Evaluate limits from the left side, right side and both sides Laws of Limits - Calculate limits using the limit laws. • Review and apply laws for constant, sum, product, quotient and exponential functions Continuous and Discontinuous Limits - Evaluate limits that are continuous and discontinuous. • Examine different types of discontinuities (removable, jump) on a graph • Identify functions that have infinite discontinuities • Use the Laws of	or guidance about a lesson objective by utilizing a personal search engine such as Google. Teachers will also collect and send out additional resource links as the need arises. All links will be submitted for approval by the administrator. Practice exercises: The teacher may assign practice exercises in addition to the online content. The teacher would have the opportunity to weight these additional assignments as part of the lesson performance score, as part of the participation grade, or as extra credit. Any editing or adjustment of the student's score requires a full justification in the notes section at the time the teacher makes the change. Universal access: The content is available at all times and on all days. Students will be able to access their online content as long as they have access to the Internet. Those that seek help from	student and the teacher for this purpose. A minimum score of 70% is required. • Discussions encourage students to reflect on concepts, articulate their thoughts, and respond to the views of others. Thus, discussions help teachers assess students' critical-thinking skills, communicatio n skills, and overall facility with the unit concepts. Each unit in this course has one predefined discussion topic. Instructors can customize the course, however, to include additional discussion topics. Online discussions may use whatever	

Continuity and Theorems to show a function is continuous Evaluation of Limits - Evaluate limits algebraically. • Identify limits that are indeterminate at some value "c" • Develop strategies for evaluating limits algebraically The Squeeze Theorem - Evaluate trigonometric limits. • Review the Squeeze Theorem graphically and algebraically • Apply the Squeeze Theorem to trigonometric limits • Graphing calculator activity o Use the graphing calculator to graph the functions f, g, and h (based on the notation of the squeeze theorem). The Intermediate Value Theorem - Apply the Intermediate Value Theorem to find at least one solution. • Use the Intermediate Value Theorem to find a solution • Use the bisection method to estimate f(x)= 0 on an interval • Graphing calculator activity	someone that may not have a computer or Internet may print the material and seek help while working on the paper version. Learning Aids: Learning aids within the courseware that are designed to assist students include: • eNotes • Resource Folder • Dictionary • Text to Speech (content reader) • Translator (16 languages) • Scientific Calculator • Math tools (graphing tool, histogram, scatter plot, stem &leaf) Students will be guided to these tools at the time of enrollment, during the video orientation, and as the need is identified by the teacher.	rubric the instructor sets. A minimum score of 70% is required. <u>Objective Assessments.</u> There is a specific learning objective associated with each lesson, which is assessed through objective assessments at multiple points during the course: at the end of the specific lesson, at the end of the unit, and at the end of the semester. Additionally, there are optional unit pretests. • Unit pretests are optional multiple-choice assessments, typically designed for credit recovery use. If a student shows mastery of a lesson's objective (70% proficiency), the student will be automatically exempted from that module in the upcoming unit.	

o Roots and Intervals Using a Graphing Calculator ▯ Use a graphing calculator to prove that the equation cos x = x2 has at least one root. Note the interval in which the root lies. Apply the Bisection Method to find a more accurate interval of length 0.01. Hint: Use f(x) = cos x – x2. ▯ Use a graphing calculator to prove that the equation x4 + x3 - 3 = 0 has at least one root. Note the interval in which the root lies. Apply the Bisection Method to find the root, rounding up to 2 decimal places. The Formal Definition of a Limit - Evaluate a limit using the precise definition of a limit. • Examine the precise definition of a limit graphically • Apply the precise definition of a limit to a function on a continuous interval Unit 3 – Derivatives Definition of the Derivative - Explore the relationship between the derivative and a tangent line. • Analyze the geometric (or graphic) interpretation of the derivative • Find the derivative		• Mastery tests at the end of each lesson provide the instructor and the student with clear indicators of areas of strength and weakness. These multiple-choice tests are taken online and contain randomly generated questions. A minimum score of 70% is required and a student may retake the mastery tests as many times as needed to demonstrate at least a 70% proficiency. • Unit posttests help instructors track how well students have mastered the unit's content. The tests are multiple-choice and are provided	

of a function at a number "a" using the definition of a derivative • Use the definition of the derivative to find the slope of a tangent line or curve at a given point • Find the equation of a tangent line at a given point • Graphing calculator activity o In this secant tool, you will see the graph of the function cosh(x) and two sliders below the graph. Note that the top slider changes the point while the bottom slider changes the point . Experiment with the two sliders to see how the slope of the secant line changes, and then answer the following questions. o Now that you've experimented with the sliders, use the bottom slider to fix the value of to . Use the top slider to change the values of to those given in the following table. Record the slope of the secant for each case. ⍰ What happens to the secant as h approaches 0? ⍰ Can you guess the slope of the tangent at ? o For the function f(x) = 2x2 + x, use the difference quotient to find the slope of the secant joining the points at x = 1		online. A minimum score of 70% is required. • End-of-semester tests assess the major objectives covered in the course. The End-of-Semester Test will be proctored (required) and a minimum score of 70% is required. Remediation assignment will be provided if a student does not meet the 70% requirement, and then a new End-of-Semester test will be administered. By combining the unit pretest (if applicable) and unit posttest information with the end-of-semester test results, the instructor will gain a clear picture of student progress. The tests are multiple-choice	

and a = 2. o For the function f(x) = 2x2 + x, complete the table with the values of the difference quotient to estimate the slope at the point x = 1. ▯ Based on what you have learned in this lesson activity, what limit formula can be used to find the tangent line of a function at a specific point? Instantaneous Rate of Change - Use the derivative to represent an instantaneous rate of change. • Calculate the rate of change from function • Interpret the rate of change within the context of a problem • Approximate the rate of change from graphs and tables Graphing the Derivative - Use the derivative as a function. • Explore the relationship between the graph of a function and its derivative • Match the graph of a function with the graph of its derivative function • Understand the various notations for the derivative • Graphing calculator activity o First play around		(randomly generated questions) and are provided online. Remediation: Students that attain less than 70% on assignments will be required to complete a remediation assignment and make corrections to the assignments and eNotes. Teachers will work with the student to assist and reteach as needed. Instructional Feedback: Teachers will provide instructional feedback in teacher-graded assignments. Students will email the teacher with confirmation that the teacher's comments and instructional was read and understood. A midterm project is required. Examples include: • Virtual field trip • Group or individual service learning activities • Video presentation • Web portfolio • Book Report • Research Project	

with the Calculus Grapher tool to explore the relationship between the graphs of a function and its derivative. You can create a function graph by dragging the line below and above the x-axis. As you create a graph, its derivative graph is automatically created. Here are some things you can do to explore different graphs in the tool: ▯ Create graphs of different shapes using the buttons on the right. ▯ Combine different shapes and observe the corresponding derivatives. ▯ Use the slider to stretch your graphs along the x-axis. o For every change you make in the graph, watch carefully how the derivative changes as you distort the function. o Activate the Grid and Cursor from the panel on the right and compare the values of the function and its derivative. Once you've familiarized yourself with the tool, go to the Calculus Grapher section of your Lesson Activities document, where you'll find a list of instructions to perform with the Calculus Grapher and questions to answer. Differentiability and Continuity - Determine		A final research paper is required. • It relates to or enriches course content • Students will have multiple topic options • Students may request an alternate subject (in a timely manner & appropriately) • MLA format is required • Six traits rubric used <u>Scoring Rubric will vary based on type of activities in each course. Example:</u> • Participation and Progress = 10% • Discussions = 10% • Drop Box (Unit/ Lesson Activities) = 20% • Post Unit Tests = 20% • Midterm Project = 10% • End-of-Semester Test = 20% • Final Research Paper = 10% Total=100% <u>Curriculum Reports:</u> Edmentum LMS	

when a function can fail to be differentiable. • Understand the difference between differentiability and continuity • Identify instances when the derivative does not exists (corner, discontinuity, vertical tangent) The Formal Definition of the Derivative - Differentiate a function using the basic rules of differentiation. • Develop the rules for finding derivatives by using the formal definition of the derivative Differentiation Rules - Learn and apply rules for differentiating functions. • Find the derivative using the constant function, power function and constant multiple rules • Find the derivative of a sum or difference function using the rules of differentiation • Find the derivative using the product rule • Find the derivative using the quotient rule • Find the derivative using the general power rule Higher Order Derivatives - Explore higher order derivatives. • Find higher-order		(PLATO Courseware) provides a wide array of reports that provide useable data concerning mastery of each lesson and assignment. Reports include: • Learner Progress Report by Learner • Learner Progress Report by Class • Learner Daily Usage by Learner • Learner Daily Usage by Class and Assignment • Curriculum Items Response Report Curriculum Strengths and Needs by Class	

derivatives (i.e. 2nd, 3rd, etc) • Identify the curves on a graph that represent the original function as well as the first, second and third derivatives • Use higher order derivatives to determine rates of change (velocity, acceleration, jerk) Differentiation of Trigonometric Functions - Differentiate trigonometric functions. • Develop rules for finding derivatives of trigonometric functions by using the definition of the derivative • Review limits of trigonometric functions • Find the derivative of a trigonometric function • Explore the use of simplification using the trigonometric identities prior to finding the derivative of a function involving multiple trigonometric functions The Chain Rule - Differentiate using the chain rule. • Demonstrate differentiation on composite functions by using the chain rule • Demonstrate the use the power rule combined with the chain rule to find the derivative			

of composite power function Differentiation of Implicit Functions - Perform implicit differentiation. • Describe how and when implicit differentiation is used • Perform implicit differentiation • Use technology to explore the graphs of an equation and its derivative Differentiation in the Real World - Apply differentiation techniques in rates of change problems. • Explain the difference between the average rate of change and the instantaneous rate of change • Setup and calculate problems to find the rate of change Unit 4 – Application of Derivatives Linear Approximations - Use linear approximation and graphs to solve problems requiring linearization. • Define how "differentials" can be used as independent and dependent variables • Perform linearization of a function • Investigate approximation error and			

accuracy Fermat's Theorem and Maximum and Minimum Values - Identify extrema on an interval from a graph. • Find maximum and minimum values on an open and closed intervals (identify as absolute or local) • Describe the difference between absolute and local maximum (and minimum) values • Identify extreme values on continuous and non-continuous intervals • Use Fermat's Theorem to find local maximum and minimum values of a function • Identify critical numbers of a function on a closed interval The Mean Value Theorem - Explore the Mean Value Theorem. • Explore a graphical representation of the Mean Value Theorem • Use Rolle's Theorem to show the proof of the Mean Value Theorem • Use the Mean Value Theorem to find a number "c" that satisfies the conclusion • Geometrically understand the mean value theorem • Explore the three			

hypotheses of Rolle's Theorem • Use Rolle's Theorem to find the number where Rolle's Theorem is satisfied The First Derivative Test - Examine the First Derivative Test and use it to aid in graphing. • Explore the use of the First Derivative Test graphically • Use the First Derivative Test to identify the interval on which a function is increasing and decreasing • Apply the First Derivative Test to identify local maximum or local minimum values at a critical number "c" • Graph a function while using the results of the First Derivative Test The Second Derivative Test - Examine the Second Derivative Test and use it to aid in graphing. • Explore the use of the Second Derivative Test graphically • Use the Second Derivative Test to identify intervals on which a function is concave upward or downward • Use the Second Derivative Test to identify any points of inflection • Use the Second Derivative Test to identify			

local maximum and minimum values • Graph a function while using the results of the Second Derivative Test Limits at Infinity and Asymptote - Identify limits at infinity. • Determine limits at infinity • Determine horizontal asymptotes of a graph or function (if they exist) • Use the precise definition of a limit to find the corresponding number N • Graphing calculator activity o Using a graphing calculator, find the vertical asymptote for the function. Write down the steps you took to reach your answer. o Using a graphing calculator, find the vertical asymptote for the function. Write down the steps you took to reach your answer. Curve Sketching - Apply the techniques from limits and derivatives to curve sketching. • Demonstrate how the use function basics as well as first and second derivative tests and asymptotes to aid in sketching a curve • Demonstrate how calculators or technology			

can aid in curve sketching Comparing Related Rates - Calculate related rates problems. • Use the derivative to find the solution to problems that involve the rate of change of one quantity in terms of the rate of change of another quantity Maximum and Minimum Applications - Perform differentiation in order to solve applied problems. • Solve applied maximum and minimum problems in the areas of physics, business and economics • Solve optimization problems Newton's Method - Explore Newton's method graphically and algebraically. • Explore Newton's method graphically • Perform the necessary calculations involved in Newton's method to find the approximate value Semester B Unit 1 – The Definite Integral The Antiderivative - Explore the concept of the antiderivative by using the			

derivative. • Explore the definition of the antiderivative • Understand the use of "C" when finding the antiderivative • Create the graph of an antiderivative using a given function • Find the antiderivative in its general form and with given specific conditions • Graphing calculator activity o Assume a function, F(x) = sin x + C, is an antiderivative of a function f(x). Using a graphing calculator, substitute different values for C and plot each function. Do you notice any similarity in the graphs of these functions? Note your observations. Area Under a Curve - Explore the area problem graphically and by using summation notation. • Estimate the area below a curve using by splitting the region into rectangles (2, 4, 8, etc) • Estimate distance traveled by using the velocities at various times • State the differences in estimating the area below a curve using the left endpoint, right endpoint and midpoint for a curves that			

are increasing and decreasing • Find the area below a curve by splitting the region into n rectangles while using the left and right endpoints as n approaches infinity • Use sigma notation to simplify limit problems The Definite Integral - Examine the definition of the definite integral. • Perform integration by using the definition of the definite integral • Understand how formulas for sums are used in finding the definite integral • Compare area found using sum to definition of definite integral • Explore how the area is affected by curves that are above the x-axis, below the x-axis and both above and below the x-axis Properties of the Definite Integral - Demonstrate the use of the properties of the definite integral. • Equate switching endpoints of a definite integral with the negative of a definite integral • Show that the area from a to a on a definite integral is zero • Find the value of definite integrals involving a constant, sum and			

difference Comparison Properties of the Definite Integral - Explore comparison properties of the definite integral. • Review the comparison properties of the definite integral graphically • Use the comparison properties to insure a plausible answer for a definite integral The Fundamental Theorem of Calculus - Explore the Fundamental Theorem of Calculus graphically and by using the definite integral. • Explain the Fundamental Theorem of Calculus graphically • Examine the proof of the Fundamental Theorem of Calculus (parts 1 and 2) • Use the Fundamental Theorem of Calculus to find the value of a definite integral • Graphing calculator activity o Plot the functions in the table for the given values of a and x. Observe the graph of each function, its integral, and the antiderivative of the integral. Write your observations in the table. The first one has been done for you.			

o Explore the geometric aspect of the theorem. Use the same functions you plotted in the earlier graph. Change the values of a and b, observe the graphs, and write your observations in the table. Indefinite Integrals - Use the tables of indefinite integrals to perform integration. • Explain the difference between a definite and indefinite integral • Find the definite and indefinite integrals of constants, simple functions and trigonometric functions using the table of indefinite integrals Applications for the Definite Integral - Explore the applications of definite integrals in terms of distance and displacement. • Find the integral of a velocity function in order to determine displacement • Use the Net Change Theorem to examine displacement vs. distance • Use the Net Change Theorem in other practical application problems The Substitution Rule - Perform integration by using the substitution rule. • Identify when the strategy of substitution is			

used to find definite and indefinite integrals • Evaluate integrals using substitution Symmetric Functions and Integration - Perform integration of symmetric functions. • Examine why a function must be continuous in order to find a definite integral • Apply the properties of symmetric functions to find during integration Unit 2 – Applications of Integration Area Between Two Curves - Determine the area between two curves. • Graphically estimate the area between two curves • Use "n" rectangles to find the area between two curves • Use the formula for area to find the area between two curves with given boundaries • Use the formula for area to find the area between two intersecting curves • Examine area problems where areas need to be split into more than one integral • Identify and calculate areas where the functions are identified as x = f(y)			

• Graphing calculator activity o Using a graphing calculator, plot the functions y = sin x + 5 and y = cos x + 3 on a coordinate plane. Shade the region under the curve y = sin x + 5 over the interval [2, 5] and label it A1. On a second coordinate plane, again plot the functions y = sin x + 5 and y = cos x + 3. Shade the region under the curve y = cos x + 3 over the interval [2, 5] and label it A2. ▯ What does A1 represent? ▯ What does A2 represent? ▯ What do you get if you subtract A2 from A1? o Using a graphing calculator, plot the functions and on a coordinate plane. Shade the region under the curve over the interval [1, 3] and label it A1.On a second coordinate plane, again plot the functions and . Shade the region under the curve over the interval [1, 3] and label it A2. ▯ What does A1 represent? ▯ What does A2 represent? ▯ What do you get if you subtract A2 from A1? o Based on your observations, what can you conclude about finding the			

area of the region between two curves y = f(x) and y = g(x) over the interval [a, b] given that f(x) g(x) for all x in [a, b]? Volume (Disk Method) - Determine the volume of a solid created by a continuous function that is rotated around a vertical or horizontal line (disk method). • Explore graphic interpretation of finding the volume of multiple cross-sections • Use technology to examine the shapes of solids created by rotated a curve around an axis • Use the definition of volume to find the volume of a curve that is rotated around the x-axis • Use the definition of volume to find the volume of a curve that is rotated around the y-axis Volume (Disk Method), Part 2 - Determine the volume of the solid created by two functions that are rotated around a vertical or horizontal line (disk method). • Use technology and graphing to visualize the shape created by rotating a one two functions around a line other than the x- or y-axis • Visualize the cross-section of the volume by			

identifying the washers that make up the volume of the solid • Perform the integration to find the volume Volume (Cylindrical Shells Method) - Determine the volume of a solid by using the method of cylindrical shells. • Identify the graphs of volumes that are easier to calculate using the method of cylindrical shells • Use technology and graphing to visualize the shape created by rotating • Visualize the cylindrical shells that will be used make up the volume of the solid • Perform the integration to find the volume Work - Use the definite integral to calculate work. • Examine the relationships between work, force and distance • Related the definite integral to work • Calculate work Mean Value Theorem for Integrals - Use the Mean Value Theorem for Integrals to find the average value of a function. • Illustrate the average value of a function graphically			

• Compute the average value of a function Unit 3 – Inversion Functions Inverse Functions - Calculate the inverse of a function. • Explore the concept of one-to-one • Graph a function and its inverse • Find the inverse function of a one-to-one function Differentiating Exponential Functions - Differentiate exponential functions. • Review the properties of exponential functions • Explore the graphs of exponential functions in order to determine where the function is continuous • Find the derivative of the exponential function using the definition of the derivative • Find the derivative of exponential functions that involve the product rule, quotient rule and chain rule, etc. Integrating Exponential Functions - Evaluate integrals that include exponential functions. • Evaluate definite and indefinite integrals that include the exponential function (base a and e)			

Differentiating Logarithmic Functions - Differentiate logarithmic functions. • Review the properties of logarithmic functions • Explore the graphs of logarithmic functions in order to determine where the function is continuous • Find the derivative of logarithmic functions • Find the derivative of logarithmic functions that involve the product rule, quotient rule and chain rule, etc. • Use logarithmic differentiation to find the derivative of a complicated function that includes products, quotients or powers The Logarithm as an Integral - Evaluate integrals that include logarithmic functions. • Evaluate definite and indefinite integrals that result in logarithmic functions (base e). Exponential Growth and Decay - Complete problems that involve exponential growth and decay. • Use the formulas to solve problems using laws of natural growth and decay L'Hopitals Rule - Explore indeterminate forms and			

L'Hopitals's Rule. • Use L'Hopital's Rule to evaluate the limit of function Differentiating Inverse Trigonometric Functions - Differentiate inverse trigonometric functions. • Explore the graphs of trigonometric functions and their inverses • Perform differentiation on inverse trigonometric functions • Find the derivative of inverse trigonometric functions that involve the product rule, quotient rule and chain rule Integration Formulas for Inverse Trigonometric Functions - Evaluate integrals of inverse trigonometric functions. • Use substitution and the formulas to evaluate integrals that follow the pattern of inverse trig functions Differentiating Hyperbolic Trigonometric Functions - Differentiate hyperbolic trigonometric functions and their inverses. • Explore the graphs of hyperbolic trigonometric functions and their inverses • Perform differentiation on hyperbolic trigonometric functions			

• Perform differentiation on an inverse hyperbolic trigonometric functions Integrating Hyperbolic Trigonometric Functions - Evaluate integrals of hyperbolic functions. • Explore the graphs of exponential functions and hyperbolic functions • Use formulas and substitution to evaluate the integrals of hyperbolic functions Unit 4 – Techniques of Integration Integration by Parts - Evaluate integrals by using integration by parts. • Identify integrals that cannot be completed using previously learned methods • Find the indefinite integral using integration by parts • Find the definite integral using integration by parts Strategies for Evaluating Complex Trigonometric Functions - Evaluate integrals that include powers of trigonometric functions. • Use trigonometric identities to form strategies for evaluating trigonometric functions			

involving powers • Integrate trigonometric definite and indefinite integrals Trigonometric Substitution - Evaluate integrals that can be solved by trigonometric substitution. • Identify integrals that can be handled using trigonometric substitution • Use the trigonometric functions and the parts of a triangle to determine valid substitutions • Perform integration using trigonometric substitution Integration by Partial Fractions - Evaluate integrals of rational functions. • Use long division of algebraic statements in order to rewrite a rational function • Use partial fractions to rewrite rational functions • Evaluate indefinite and definite integrals of rational functions Using Integration Tables - Evaluate integrals using the tables of integration formulas. • Describe the categories of integrals included in tables • Use the tables and			

substitution to evaluate integrals Strategies for Integrating Functions - Strategize methods for integration. • Examine all methods for evaluating integrals • Determine strategy and evaluate integrals using any method • Explore technology that can be used to evaluate integrals Methods for Approximating an Integral - Calculate approximations of integrals. • Explore the Midpoint Rule graphically • Calculate the area using the Midpoint Rule • Explore the Trapezoidal Rule graphically • Calculate the area using the Trapezoidal Rule • Explore Simpson's Rule graphically • Calculate the area using Simpson's Rule • Compare the results of calculating area using the Trapezoidal Rule and Simpson's Rule Improper Integrals - Evaluate improper integrals. • Evaluate integrals that converge and diverge • Evaluate integrals that are discontinuous			

Unit 5 – Further Applications of Integration Arc Length - Calculate the arc length of a continuous curve. • Estimate the length of a curve graphically by dividing the curve into 2, 4, 6, etc. segments • Use the Arc Length formula to calculate the length of a curve using either dy/dx or dx/dy • Apply the use of arc length in practical setting Surface Area - Calculate the surface area of a revolution. • Use technology and graphing to visualize the surface area of a solid • Compare techniques of finding basic solids to solids created from rotating an equation about a line • Calculate the surface area of a revolution by using either dy/dx or dx/dy • Apply the use of surface area in a practical setting Calculus in Physics, Engineering, and Biology - Explore applications to physics, biology and engineering. • Create and evaluate integrals that represent volumes and surface areas			

which may include pressure and center of mass • Create and evaluate integrals that represent blood flow, cardiac output, etc. Calculus in Economics - Explore applications to economics. • Create and evaluate integrals that represent consumer surplus • Create and evaluate integrals that represent blood flow, cardiac output, etc. Calculus in Probability - Explore applications to probability. • Create and evaluate integrals that represent are below the curve which represent probabilities • Use the function for the normal distribution to evaluate areas below the curve (compare to tables)			