

**COURSE OF STUDY  
MATHEMATICS**

**Name of Course:** AP Calculus      **Length of Course:** One Year, Grade 12  
**Course Number:** 343      **Type of Offering:** Mathematics Credit  
**Grade Level:** 12      **Credit Value:** AP Credit  
**Prerequisite/s:** Hon PreCalc/Teacher Recomm.      **Minutes:** 7200 minutes

**COURSE DESCRIPTION:**

This course is an introduction to Calculus. An intuitive approach is used to introduce the basic concept, while the theoretical aspect is presented but not emphasized. Taking the Calculus AB Advanced Placement Test is not mandatory, although topics tested will be covered. A recommendation from the math department is needed to take this course.

**TEXTBOOK/S (if applicable)**

**Title:** Calculus: Graphical, Numerical, Algebraic  
**Publisher:** Pearson/Prentice-Hall  
**Copyright:** 2003

**OTHER RESOURCES:** Calculus textbooks  
Supplemental Books  
Graphing calculators  
Internet sites  
Other, as available

Course Advanced Placement Calculus

Grade Level 12

Unit of Study Unit 1: Prerequisites for Calculus

Instructional Time 480 Minutes

Anchor & Academic Standard (Eligible Content)	Content	Teaching Method(s)	Materials & Resources	Assessment
<p>The following Standards apply to all units and sections:</p> <p>2.2.11. A. Develop and use computation concepts, operations and procedures on real numbers in problem solving situations.</p> <p>2.2.11. F. Demonstrate skills for using computer spreadsheets and scientific and graphing calculators.</p> <p>2.5.11.A. Select and use appropriate mathematical concepts and techniques from different areas of mathematics and apply them to solving non- routine and multi- step problems.</p> <p>2.5.11.C. Present mathematical procedures and results clearly, systematically, succinctly and correctly.</p> <p>2.8.11.H. Select and use an appropriate strategy to solve systems of equations and inequalities using graphing calculators, symbol manipulators, spreadsheets, and other software.</p> <p>2.8.11.S. Analyze properties and relationships of functions (linear, polynomial, rational, trigonometric, exponential, and logarithmic).</p> <p>Standards and Anchors specific to the section indicated:</p>			<p>Textbook: <u>Calculus: Graphical, Numerical, Algebraic</u>, by Finney, et al., Pearson/Prentice-Hall, © 2003</p> <p>Chalkboard and Chalk Notebooks Teacher Notes Graphing Calculators Supplemental Texts e.g., “How to Solve It” by Polya, “The Education of TC Mits” by Lieber, along with other calculus reference books Internet, as available</p>	

<p>M11.D.3.2.1 Apply the formula for the slope of a line to solve problems (formula given on reference sheet).</p> <p>M11.C.3.1.2 Relate slope to perpendicularity and/or parallelism (limit to linear algebraic expressions; slope formula provided on the reference sheet).</p> <p>M11.D.3.2.2 Given the graph of the line, 2 points on the line, or the slope and a point on a line, write or identify the linear equation in point-slope, standard and/or slope-intercept form.</p> <p>M11.D.3.2.3 Compute the slope and/or y-intercept represented by a linear equation or graph.</p> <p>M11.D.2.1.3 Write, solve and/or apply a linear equation (including problem situations).</p> <p>M11.D.3.1.2 Determine how a change in one variable relates to a change in a second variable (e.g., <math>y=4/x</math>, if <math>x</math> doubles, what happens to <math>y</math>?).</p> <p>M11.E.4.2.1 Draw, find and/or write an equation for a line of best fit for a scatter plot.</p> <p>M11.E.4.2.2 Make predictions using the equations or graphs of best-fit lines of scatter plots.</p> <p>M11.D.4.1.1 Match the graph of a</p>	<p>Section:</p> <p>1.) Lines</p> <p>a) Increments</p> <p>b) Slope of a line</p> <p>c) Parallel and Perpendicular lines</p> <p>d) Equations of lines</p> <p>1) Standard form</p> <p>2) Point-Slope form</p> <p>3) Two-Point form</p> <p>4) Slope-Intercept form</p> <p>e) Applications and Linear Regression</p> <p>2.) Functions, and Graphs</p>	<p>For each of the sections, the teacher will lecture on the material while randomly questioning students to check for understanding.</p> <p>This chapter is a review of Precalculus material and will be treated as such. The teacher will present a general overview of the material and the students will then complete the assignments given, with individual and small group help, as required.</p>		<p>The students will do problems, both teacher-assigned items and those of their own interests.</p> <p>The teacher will review the material to date</p>
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<p>given function to its table or equation.  M11.D.1.1.3 Identify the domain, range or inverse of a relation (may be presented as ordered pairs or a table).</p> <p>2.9.11.J. Analyze figures in terms of the kinds of symmetries they have.  M11.D.2.1.4 Write and/or solve systems of equations using graphing, substitution and/or elimination (limit systems to 2 equations).</p> <p>M11.A.2.2 Use exponents, roots and/or absolute value to solve problems.  2.11.11.C. Graph and interpret rates of growth/ decay.  M11.D.2.1.5 Solve quadratic equations using factoring (integers only – not including completing the square or the Quadratic Formula).  M11.D.1.1.1 Analyze a set of data for the existence of a pattern and represent the pattern algebraically and/or graphically.  M11.A.1.1.2 Express numbers and/or simplify expressions using scientific notation (including numbers less than 1).  M11.A.1.1.3 Simplify square roots. (e.g., <math>\sqrt{24} = 2\sqrt{6}</math>)</p> <p>M11.D.1.1.2 Determine if a relation is a function given a set of points or a graph.  2.8.11.E. Use equations to represent curves such as lines, circles, ellipses,</p>	<p>a) Functions  b) Domains and Ranges  c) Viewing and interpreting graphs</p> <p>d) Even and odd functions - symmetry  e) Piecewise defined functions  f) Absolute Value function  g) Composition of functions</p> <p>3.) Exponential Functions  a) Exponential growth  b) Exponential decay  c) Applications and exponential regression  d) The number <b>e</b>, Euler’s number</p> <p>4.) Parametric Equations  a) Relations  b) Circles  c) Ellipses  d) Lines and other curves –</p>			<p>via a question and answer period requiring students to provide all information, and re – teaching where necessary.</p> <p>The teacher will lecture on the material while randomly questioning students to check for understanding.</p>
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<p>parabolas and hyperbolas.</p> <p>M11.D.1.1.3 Identify the domain, range or inverse of a relation (may be presented as ordered pairs or a table).</p> <p>M11.C.1.1.2 Identify and/or use the properties of arcs, semicircles, inscribed angles and/or central angles.</p> <p>M11.B.2.1 Use and/or compare measurements of angles.</p> <p>2.8.11.D. Formulate expressions, equations, inequalities, systems of equations, systems of inequalities, and matrices to model routine and non-routine problem situations.</p> <p>M11.D.2.2.3 Simplify algebraic fractions.</p> <p>2.10.11. A. Use graphing calculators to display periodic and circular functions; describe properties of the graphs.</p> <p>2.8.11.Q. Represent functional relationships in tables, charts, and graphs.</p> <p>2.8.11.T. Analyze and categorize functions by their characteristics.</p>	<p>parametrization</p> <p>5.) Functions and Logarithms</p> <ul style="list-style-type: none"> <li>a) One-to-One Function</li> <li>b) Inverses</li> <li>c) Finding inverses</li> <li>d) Logarithmic functions</li> <li>e) Properties of logarithms</li> <li>f) Applications and logarithmic regression</li> </ul> <p>6.) Trigonometric Functions</p> <ul style="list-style-type: none"> <li>a) Radian measure</li> <li>b) Graphs of trigonometric functions</li> <li>c) Periodicity</li> <li>d) Even and odd trigonometric functions</li> <li>e) Transformations of trigonometric functions</li> <li>f) Applications</li> <li>g) Inverse trigonometric functions</li> </ul>			<p>The students will complete the chapter assessment, consisting of both items from the textbook materials and teacher created materials. The test will include an open-ended item as well.</p>
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Anchor & Academic Standard (Eligible Content)	Content	Teaching Method(s)	Materials & Resources	Assessment
<p>2.5.11.C. Present mathematical procedures and results clearly, systematically, succinctly and correctly.</p> <p>M11.D.2.2.2 Factor algebraic expressions, including difference of squares and trinomials (trinomials limited to the form <math>ax^2+bx+c</math> where <math>a</math> is not equal to 0).</p> <p>2.8.11.D. Formulate expressions, equations, inequalities, systems of equations, systems of inequalities, and matrices to model routine and non-routine problem situations.</p> <p>2.8.11.H. Select and use an appropriate strategy to solve systems of equations and inequalities using graphing calculators, symbol manipulators, spreadsheets, and other software.</p> <p>2.8.11.J. Demonstrate the connection between algebraic equations and inequalities and the geometry of relations in the coordinate plane.</p> <p>2.8.11.S. Analyze properties and relationships of functions (linear, polynomial, rational, trigonometric, exponential, and logarithmic).</p>	<p>Section:</p> <p>1.) Rates of Change and Limits</p> <ol style="list-style-type: none"> <li>Average and Instantaneous Speed</li> <li>Definition of limit</li> <li>Properties of Limits</li> <li>One-sided limits and two-sided limits</li> <li>The Sandwich Theorem</li> </ol> <p>2.) Limits Involving Infinity</p> <ol style="list-style-type: none"> <li>Finite limits as <math>x \rightarrow \pm\infty</math></li> <li>Sandwich Theorem revisited</li> <li>Infinite limits as <math>x \rightarrow a</math></li> <li>End behavior models</li> <li>“Seeing” limits as <math>x \rightarrow \pm\infty</math></li> </ol> <p>3.) Continuity</p> <ol style="list-style-type: none"> <li>Continuity at a point</li> <li>Continuous functions</li> <li>Algebraic combinations</li> <li>Composites</li> </ol>	<p>For each of the sections, the teacher will lecture on the material while randomly questioning students to check for understanding.</p> <p>This chapter is the foundation chapter for the concepts of differential calculus. Thus, completion of the assignments must be verified by the teacher, both for the content and correctness of the students’ work.</p>	<p>Textbook: <u>Calculus: Graphical, Numerical, Algebraic</u>, by Finney, et al., Pearson/Prentice-Hall, © 2003</p> <p>Chalkboard and Chalk Notebooks Teacher Notes Graphing Calculators Supplemental Texts Internet, as available</p>	<p>The students will do problems, both teacher-assigned items and those of their own interests.</p> <p>The students will complete the chapter</p>

Course Advanced Placement Calculus

Grade Level 12

Unit of Study Unit 2: Limits and Continuity

Instructional Time 560 Minutes

<p>2.10.11. A. Use graphing calculators to display periodic and circular functions; describe properties of the graphs. M11.C.3.1.2 Relate slope to perpendicularity and/or parallelism (limit to linear algebraic expressions; slope formula provided on the reference sheet).</p>	<p>e) Intermediate Value Theorem for Continuous Functions</p> <p>4.) Rates of Change and Tangent Lines</p> <p>a) Average Rates of Change b) Tangent to a curve c) Slope of a curve d) Normal to a curve e) Speed revisited</p>	<p>The teacher will review the material to date via a question and answer period requiring students to provide all information, and re-teaching where necessary.</p>		<p>assessment, consisting of both items from the textbook materials and teacher created materials. The test will include an open-ended item as well.</p>
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Anchor & Academic Standard (Eligible Content)	Content	Teaching Method(s)	Materials & Resources	Assessment
<p>2.8.11.D. Formulate expressions, equations, inequalities, systems of equations, systems of inequalities, and matrices to model routine and non-routine problem situations.</p> <p>2.8.11.E. Use equations to represent curves such as lines, circles, ellipses, parabolas and hyperbolas.</p> <p>2.8.11.J. Demonstrate the connection between algebraic equations and inequalities and the geometry of relations in the coordinate plane.</p> <p>2.8.11.N. Solve linear, quadratic, and exponential equations both symbolically and graphically.</p> <p>2.8.11.Q. Represent functional relationships in tables, charts, and graphs.</p> <p>2.8.11.S. Analyze properties and relationships of functions (linear, polynomial, rational, trigonometric, exponential, and logarithmic).</p> <p>2.8.11.T. Analyze and categorize functions by their characteristics.</p>	<p>Section:</p> <p>1.) Derivative of a Function</p> <ul style="list-style-type: none"> <li>a) Definition of Derivative</li> <li>b) Notation</li> <li>c) Relationships between the graphs of <math>f</math> and <math>f'</math></li> <li>d) Graphing the derivative from data</li> <li>e) One-sided derivatives</li> </ul> <p>2.) Differentiability</p> <ul style="list-style-type: none"> <li>a) How <math>f'(a)</math> might fail to exist</li> <li>b) Differentiability implies local linearity</li> <li>c) Derivatives on a calculator</li> <li>d) Differentiability implies continuity</li> <li>e) Intermediate Value Theorem for Derivatives</li> </ul> <p>3.) Rules for Differentiation</p> <ul style="list-style-type: none"> <li>a) Positive integer powers, multiples, sums and differences</li> <li>b) Products and quotients</li> <li>c) Negative integer powers of <math>x</math></li> <li>d) Second and higher order derivatives</li> </ul>	<p>For each of the sections, the teacher will lecture on the material while randomly questioning students to check for understanding.</p> <p>This chapter presents the concepts of finding derivatives, which are the basics of differential calculus. Thus, completion of the assignments must be verified by the teacher, both for the content and correctness of the students' work.</p>	<p>Textbook: <u>Calculus: Graphical, Numerical, Algebraic</u>, by Finney, et al., Pearson/Prentice-Hall, © 2003</p> <p>Chalkboard and Chalk Notebooks Teacher Notes Graphing Calculators Supplemental Texts Internet, as available</p>	<p>The students will do problems, both teacher-assigned items and those of their own interests.</p>



<p>S11.C.3.1.3 Explain that acceleration is the rate at which the velocity of an object is changing.</p> <p>2.10.11. A. Use graphing calculators to display periodic and circular functions; describe properties of the graphs.</p> <p>2.8.11.D. Formulate expressions, equations, inequalities, systems of equations, systems of inequalities, and matrices to model routine and non-routine problem situations.</p> <p>2.8.11.D. Formulate expressions, equations, inequalities, systems of equations, systems of inequalities, and matrices to model routine and non-routine problem situations.</p> <p>2.10.11. A. Use graphing calculators to display periodic and circular functions; describe properties of the graphs.</p>	<p>4.) Velocity and Other Rates of Change</p> <ul style="list-style-type: none"> <li>a) Instantaneous rates of change</li> <li>b) Motion along a line</li> <li>c) Sensitivity to change</li> <li>d) Derivatives in economics</li> </ul> <p>5.) Derivatives of Trigonometric Functions</p> <ul style="list-style-type: none"> <li>a) Derivative of the sine function</li> <li>b) Derivative of cosine function</li> <li>c) Simple harmonic motion</li> <li>d) Jerk</li> <li>e) Derivatives of the other basic trigonometric functions</li> </ul> <p>6.) The Chain Rule</p> <ul style="list-style-type: none"> <li>a) Derivative of a composite function</li> <li>b) The “Outside-inside” rule</li> <li>c) Repeated use of the chain rule</li> <li>d) Slopes of parametrized curves</li> <li>e) Power Chain Rule</li> </ul> <p>7.) Implicit Differentiation</p> <ul style="list-style-type: none"> <li>a) Implicitly defined functions</li> <li>b) Lenses, tangents and normal lines</li> <li>c) Derivatives of higher order</li> <li>d) Rational powers of differentiable functions</li> </ul> <p>8.) Derivatives of Inverse Trigonometric Functions</p> <ul style="list-style-type: none"> <li>a) Derivatives of inverse</li> </ul>	<p>The teacher will review the material to date via a question and answer period requiring students to provide all information, and re-teaching where necessary.</p>		<p>The students will complete the assessment on the first five sections of Chapter 3, consisting of both items from the textbook materials and teacher created materials. The test will include an open-ended item as well.</p>
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<p>2.11.11.C. Graph and interpret rates of growth/ decay.</p>	<p>functions                  b) Derivative of the arcsine                  c) Derivative of the arctangent                  d) Derivative of the arcsecant                  e) Derivatives of the other three</p> <p>9.) Derivatives of Exponential and Logarithmic Functions                  a) Derivative of <math>e^x</math>                  b) Derivative of <math>a^x</math>                  c) Derivative of <math>\ln x</math>                  d) Derivative of <math>\log_a x</math>                  e) Power Rule of Arbitrary Real Powers</p>	<p>The teacher will review the material to date via a question and answer period requiring students to provide all information, and re-teaching where necessary.</p>		<p>The students will complete the chapter assessment, consisting of both items from the textbook materials and teacher created materials. The test will include an open-ended item as well.</p>
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Anchor & Academic Standard (Eligible Content)	Content	Teaching Method(s)	Materials & Resources	Assessment
<p>2.11.11.A. Determine maximum and minimum values of a function over a specified interval.</p> <p>2.11.11.B. Interpret maximum and minimum values in problem situations.</p> <p>M11.D.3.1.1 Identify, describe and/or use constant or varying rates of change.</p> <p>2.5.11.B. Use symbols, mathematical terminology, standard notation, mathematical rules, graphing and other types of mathematical representations to communicate observations, predictions, concepts, procedures, generalizations, ideas and results.</p> <p>2.11.11.A. Determine maximum and minimum values of a function over a specified interval.</p> <p>2.11.11.B. Interpret maximum and minimum values in problem situations.</p>	<p>Section:</p> <p>1.) Extreme Values of Functions</p> <ol style="list-style-type: none"> <li>Absolute (global) extreme values</li> <li>Local (relative) extreme values</li> <li>Finding extreme values</li> </ol> <p>2.) Mean Value Theorem</p> <ol style="list-style-type: none"> <li>Mean Value Theorem</li> <li>Physical interpretation</li> <li>Increasing and decreasing functions</li> <li>Other consequences</li> </ol> <p>3.) Connecting <math>f'</math> and <math>f''</math> with the Graph of <math>f</math></p> <ol style="list-style-type: none"> <li>The First Derivative Test for local extrema</li> <li>Concavity</li> <li>Points of inflection</li> <li>The Second Derivative Test for local extrema</li> <li>Learning about functions from derivatives</li> </ol>	<p>For each of the sections, the teacher will lecture on the material while randomly questioning students to check for understanding.</p>	<p>Textbook: <u>Calculus: Graphical, Numerical, Algebraic</u>, by Finney, et al., Pearson/Prentice-Hall, © 2003</p> <p>Chalkboard and Chalk Notebooks Teacher Notes Graphing Calculators Supplemental Texts Internet, as available</p>	<p>The students will do problems, both teacher-assigned items and those of their own interests.</p>

<p>2.5.11.C. Present mathematical procedures and results clearly, systematically, succinctly and correctly.</p> <p>2.5.11.D. Conclude a solution process with a summary of results and evaluate the degree to which the results obtained represent an acceptable response to the initial problem and why the reasoning is valid.</p> <p>2.8.11.B. Give examples of patterns that occur in data from other disciplines.</p> <p>2.8.11.D. Formulate expressions, equations, inequalities, systems of equations, systems of inequalities, and matrices to model routine and non-routine problem situations.</p> <p>2.8.11.G. Analyze and explain systems of equations, systems of inequalities and matrices.</p> <p>2.8.11.R. Create and interpret functional models.</p> <p>M11.C.1.3.1 Identify and/or use properties of congruent and similar polygons or solids.</p> <p>M11.B.2.2 Use and/or develop procedures to determine or describe measures of perimeter, circumference, area, surface area</p>	<p>4.) Modeling and Optimization</p> <ul style="list-style-type: none"> <li>a) Examples from business and industry</li> <li>b) Examples from mathematics</li> <li>c) Examples from economics</li> <li>d) Modeling discrete phenomena with differentiable functions</li> </ul> <p>5.) Linearization and Newton’s Method</p> <ul style="list-style-type: none"> <li>a) Linear approximation</li> <li>b) Newton's method</li> <li>c) Differentials</li> <li>d) Estimating change with differentials</li> <li>e) Absolute, relative and percentage change</li> <li>f) Sensitivity to change</li> </ul> <p>6.) Related Rates</p> <ul style="list-style-type: none"> <li>a) Related rate equations</li>   <li>b) Solution strategy</li> </ul>			<p>The students will be required to write a Fairy-Tale or other such story in which related rates is directly involved in the resolution of the story line.</p>
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<p>and/or volume. (May require conversions within the same system.)</p> <p>M11.A.3.2.1 Use estimation to solve problems.</p> <p>M11.A.2.1.1 Solve problems using operations with rational numbers including rates and percents (single and multi-step and multiple procedure operations) (e.g., distance, work and mixture problems, etc.).</p> <p>M11.A.2.1.2 Solve problems using direct and inverse proportions.</p> <p>2.8.11.Q. Represent functional relationships in tables, charts, and graphs.</p> <p>2.8.11.R. Create and interpret functional models.</p> <p>2.10.11.B. Identify, create and solve practical problems involving right triangles using the trigonometric functions and the Pythagorean Theorem.</p> <p>2.11.11.A. Determine maximum and minimum values of a function over a specified interval.</p> <p>2.11.11.B. Interpret maximum and minimum values in problem situations.</p>	<p>c) Simulating related motion</p>	<p>The teacher will review the material to date via a question and answer period requiring students to provide all information, and re-teaching where necessary.</p>		<p>The students will complete the chapter assessment, consisting of both items from the textbook materials and teacher created materials. The test will include an open-ended item as well.</p>
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Anchor & Academic Standard (Eligible Content)	Content	Teaching Method(s)	Materials & Resources	Assessment
<p>2.11.11.D. Determine sums of finite sequences of numbers and infinite geometric series.</p> <p>2.11.11.E. Estimate areas under curves using sequences of areas .</p> <p>2.5.11.B. Use symbols, mathematical terminology, standard notation, mathematical rules, graphing and other types of mathematical representations to communicate observations, predictions, concepts, procedures, generalizations, ideas and results.</p> <p>2.8.11.B. Give examples of patterns that occur in data from other disciplines.</p> <p>2.8.11.D. Formulate expressions, equations, inequalities, systems of equations, systems of inequalities, and matrices to model routine and non-routine problem situations.</p> <p>2.8.11.J. Demonstrate the connection between algebraic equations and inequalities and the geometry of</p>	<p>Section:</p> <p>1.) Estimating with Finite Sums</p> <ol style="list-style-type: none"> <li>Distance traveled</li> <li>Rectangular Approximation Method (RAM)</li> <li>Volume of a sphere</li> <li>Cardiac output</li> </ol> <p>2.) Definite Integrals</p> <ol style="list-style-type: none"> <li>Riemann Sums</li> <li>Terminology and notation of integration</li> <li>Definite integral and area</li> <li>Constant functions</li> <li>Integrals on a calculator (FNINT)</li> <li>Discontinuous integrable functions</li> </ol> <p>3.) Definite Integrals and Antiderivatives</p> <ol style="list-style-type: none"> <li>Properties of definite integrals</li> <li>Average value of a function</li> <li>Mean Value Theorem for Definite Integrals</li> <li>Connecting differential and integral calculus</li> </ol> <p>4.) Fundamental Theorem of Calculus</p> <ol style="list-style-type: none"> <li>Fundamental Theorem, Part 1</li> </ol>	<p>For each of the sections, the teacher will lecture on the material while randomly questioning students to check for understanding.</p>	<p>Textbook: <u>Calculus: Graphical, Numerical, Algebraic</u>, by Finney, et al., Pearson/Prentice-Hall, © 2003</p> <p>Chalkboard and Chalk Notebooks Teacher Notes Graphing Calculators Supplemental Texts Internet, as available</p>	<p>The students will do problems, both teacher-assigned items and those of their own interests.</p> <p>The students</p>

<p>relations in the coordinate plane.                  2.8.11.N. Solve linear, quadratic, and exponential equations both symbolically and graphically.                  2.8.11.Q. Represent functional relationships in tables, charts, and graphs.</p> <p>2.8.11.R. Create and interpret functional models.                  2.8.11.S. Analyze properties and relationships of functions (linear, polynomial, rational, trigonometric, exponential, and logarithmic).                  2.11.11.D. Determine sums of finite sequences of numbers and infinite geometric series.                  2.11.11.E. Estimate areas under curves using sequences of areas .</p>	<p>b) Graphing the function <math>\int_a^x f(t) dt</math>                  c) Fundamental Theorem, Part 2                  d) Area connection                  e) More applications</p> <p>5.) Trapezoidal Rule                  a) Trapezoidal approximations                  b) Other algorithms                  c) Error analysis</p>	<p>The teacher will review the material to date via a question and answer period requiring students to provide all information, and re-teaching where necessary.</p>		<p>will complete the chapter assessment, consisting of both items from the textbook materials and teacher created materials. The test will include an open-ended item as well.</p>
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Anchor & Academic Standard (Eligible Content)	Content	Teaching Method(s)	Materials & Resources	Assessment
<p>2.5.11.B. Use symbols, mathematical terminology, standard notation, mathematical rules, graphing and other types of mathematical representations to communicate observations, predictions, concepts, procedures, generalizations, ideas and results.</p> <p>2.5.11.D. Conclude a solution process with a summary of results and evaluate the degree to which the results obtained represent an acceptable response to the initial problem and why the reasoning is valid.</p> <p>2.8.11.D. Formulate expressions, equations, inequalities, systems of equations, systems of inequalities, and matrices to model routine and non-routine problem situations.</p> <p>2.8.11.N. Solve linear, quadratic, and exponential equations both symbolically and graphically.</p> <p>2.11.11.C. Graph and interpret rates of growth/ decay.</p>	<p>Section:</p> <p>1.) Antiderivatives and Slope Fields</p> <ul style="list-style-type: none"> <li>a) Solving initial value problems</li> <li>b) Antiderivatives and indefinite integrals</li> <li>c) Properties of indefinite integrals</li> <li>d) Applications</li> </ul> <p>2.) Integration by Substitution</p> <ul style="list-style-type: none"> <li>a) Power Rule in Integral Form</li> <li>b) Trigonometric integrands</li> <li>c) Substitution in indefinite integrals</li> <li>d) Substitution in definite integrals</li> <li>e) Separable differential equations</li> </ul> <p>3.) Integration by Parts</p> <ul style="list-style-type: none"> <li>a) Product Rule in Integral Form: <math>\int u dv = uv - \int v du</math></li> <li>b) Repeated use</li> <li>c) Solving for the unknown integral</li> <li>d) Tabular integration</li> </ul> <p>4.) Exponential Growth and Decay</p> <ul style="list-style-type: none"> <li>a) Law of Exponential Change</li> </ul>	<p>For each of the sections, the teacher will lecture on the material while randomly questioning students to check for understanding.</p>	<p>Textbook: <u>Calculus: Graphical, Numerical, Algebraic</u>, by Finney, et al., Pearson/Prentice-Hall, © 2003</p> <p>Chalkboard and Chalk Notebooks Teacher Notes Graphing Calculators Supplemental Texts Internet, as available</p>	<p>The students will do problems, both teacher-assigned items and those of their own interests.</p>



<p>2.8.11.Q. Represent functional relationships in tables, charts, and graphs.</p> <p>2.8.11.R. Create and interpret functional models.</p> <p>2.8.11.S. Analyze properties and relationships of functions (linear, polynomial, rational, trigonometric, exponential, and logarithmic).</p> <p>2.11.11.C. Graph and interpret rates of growth/ decay.</p> <p>2.8.11.T. Analyze and categorize functions by their characteristics.</p> <p>2.10.11.A. Use graphing calculators to display periodic and circular functions; describe properties of the graphs.</p> <p>2.11.11.C. Graph and interpret rates of growth/ decay.</p> <p>2.11.11.D. Determine sums of finite sequences of numbers and infinite geometric series.</p>	<p>b) Continuously compounded interest</p> <p>c) Radioactivity</p> <p>d) Newton’s Law of Cooling</p> <p>e) Resistance proportional to velocity</p> <p>5.) Population Growth</p> <p>a) Exponential model</p> <p>b) Logistic growth model</p> <p>c) Logistic regression</p> <p>6.) (optional) Numerical Methods</p> <p>a) Euler’s Method</p> <p>b) Numerical solutions</p> <p>c) Graphical solutions</p> <p>d) Improved Euler’s Method</p>	<p>The teacher will review the material to date via a question and answer period requiring students to provide all information, and re – teaching where necessary.</p>		<p>The students will complete the chapter assessment, consisting of both items from the textbook materials and teacher created materials. The test will include an open-ended item as well.</p>
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Anchor & Academic Standard (Eligible Content)	Content	Teaching Method(s)	Materials & Resources	Assessment
<p>2.5.11.B. Use symbols, mathematical terminology, standard notation, mathematical rules, graphing and other types of mathematical representations to communicate observations, predictions, concepts, procedures, generalizations, ideas and results.</p> <p>2.11.11.D. Determine sums of finite sequences of numbers and infinite geometric series.</p> <p>2.11.11.E. Estimate areas under curves using sequences of areas .</p> <p>2.5.11.D. Conclude a solution process with a summary of results and evaluate the degree to which the results obtained represent an acceptable response to the initial problem and why the reasoning is valid.</p> <p>2.8.11.D. Formulate expressions, equations, inequalities, systems of equations, systems of inequalities, and matrices to model routine and non-</p>	<p>Section:</p> <p>1.) Integral as Net Change</p> <ol style="list-style-type: none"> <li>Linear motion revisited</li> <li>General strategy</li> <li>Consumption over time</li> <li>Net change from data</li> <li>Work</li> </ol> <p>2.) Areas in the Plane</p> <ol style="list-style-type: none"> <li>Area between curves</li> <li>Area enclosed by intersecting curves</li> <li>Boundaries with changing functions</li> <li>Integrating with respect to y</li> <li>Saving time with geometry formulas</li> </ol> <p>3.) Volumes</p> <ol style="list-style-type: none"> <li>Volume as an integral</li> <li>square cross sections</li> <li>Circular cross sections</li> <li>Cylindrical shells</li> <li>Other cross sections</li> </ol> <p>4.) Lengths of Curves</p> <ol style="list-style-type: none"> <li>A sine wave</li> <li>Length of a smooth curve</li> <li>Vertical tangents, corners, and</li> </ol>	<p>For each of the sections, the teacher will lecture on the material while randomly questioning students to check for understanding.</p>	<p>Textbook: <u>Calculus: Graphical, Numerical, Algebraic</u>, by Finney, et al., Pearson/Prentice-Hall, © 2003</p> <p>Chalkboard and Chalk Notebooks Teacher Notes Graphing Calculators Supplemental Texts Internet, as available</p>	<p>The students will do problems, both teacher-assigned items and those of their own interests.</p> <p>The students will complete the</p>

Course Advanced Placement Calculus

Grade Level 12

Unit of Study Unit 7: Applications of Definite Integrals

Instructional Time 960 Minutes

<p>routine problem situations. 2.8.11.J. Demonstrate the connection between algebraic equations and inequalities and the geometry of relations in the coordinate plane.</p> <p>2.8.11.N. Solve linear, quadratic, and exponential equations both symbolically and graphically. 2.8.11.Q. Represent functional relationships in tables, charts, and graphs. 2.8.11.R. Create and interpret functional models.</p>	<p>cusps</p> <p>5.) Applications from Science and Statistics</p> <ul style="list-style-type: none"><li>a) Work revisited</li><li>b) Fluid force and fluid pressure</li><li>c) Normal probabilities</li></ul>	<p>The teacher will review the material to date via a question and answer period requiring students to provide all information, and re – teaching where necessary.</p>		<p>chapter assessment, consisting of both items from the textbook materials and teacher created materials. The test will include an open-ended item as well.</p>
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Anchor & Academic Standard (Eligible Content)	Content	Teaching Method(s)	Materials & Resources	Assessment
<p>2.5.11.C. Present mathematical procedures and results clearly, systematically, succinctly and correctly.</p> <p>2.5.11.D. Conclude a solution process with a summary of results and evaluate the degree to which the results obtained represent an acceptable response to the initial problem and why the reasoning is valid.</p> <p>2.6.8.F. Use scientific and graphing calculators and computer spreadsheets to organize and analyze data.</p> <p>2.8.11.C. Use patterns, sequences and series to solve routine and non-routine problems.</p> <p>2.8.11.H. Select and use an appropriate strategy to solve systems of equations and inequalities using graphing calculators, symbol manipulators, spreadsheets, and other software.</p> <p>2.8.11.J. Demonstrate the connection between algebraic equations and inequalities and the geometry of relations in the coordinate plane.</p> <p>2.8.11.N. Solve linear, quadratic, and</p>	<p>Section:</p> <p>1.) L'Hôpital's Rule</p> <ul style="list-style-type: none"> <li>a) Indeterminate Form <math>0/0</math></li> <li>b) Indeterminate Forms <math>\infty/\infty</math>, <math>\infty \cdot 0</math>, <math>\infty - \infty</math></li> <li>c) Indeterminate forms <math>1^\infty</math>, <math>0^0</math>, <math>\infty^0</math></li> </ul> <p>2.) Relative Rates of Growth</p> <ul style="list-style-type: none"> <li>a) Comparing rates of growth</li> <li>b) Order and Oh-notation (Optional)</li> <li>c) Sequential versus binary search</li> </ul> <p>3.) Improper Integrals</p> <ul style="list-style-type: none"> <li>a) Infinite limits of integration</li> <li>b) The integral <math>\int_1^\infty dx/x^p</math></li> <li>c) Integrands with infinite discontinuities</li> <li>d) Tests for convergence and divergence</li> <li>e) Applications</li> </ul> <p>4.) Partial Fractions and Integral Tables</p> <ul style="list-style-type: none"> <li>a) Partial fractions</li> <li>b) General description of the method</li> </ul>	<p>For each of the sections, the teacher will lecture on the material while randomly questioning students to check for understanding.</p> <p>The teacher will review the material to date via a question and answer period requiring students to provide all information, and re</p>	<p>Textbook: <u>Calculus: Graphical, Numerical, Algebraic</u>, by Finney, et al., Pearson/Prentice-Hall, © 2003</p> <p>Chalkboard and Chalk Notebooks Teacher Notes Graphing Calculators Supplemental Texts Internet, as available</p>	<p>The students will do problems, both teacher-assigned items and those of their own interests.</p> <p>The students will complete the chapter assessment, consisting of both items from the textbook materials and teacher created materials. The test will include</p>

exponential equations both symbolically and graphically. 2.8.11.R. Create and interpret functional models.	c) Integral tables d) Trigonometric substitutions	– teaching where necessary.		an open-ended item as well.
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