

MATHEMATICS
HINSDALE SCHOOL DISTRICT

Course: AP Calculus

Standard: The AP test criteria drive the classroom curriculum

Knowledge & Skills	Content	Activities Resources & Materials	Assessments
<p>Students will have an understanding of the Intermediate Value Theorem (ITV).</p> <p>Students will understand and apply concepts of differentiation</p>	<p>Definition of the ITV</p> <p>The relationship between the tangent line and slope</p> <p>Define the derivative</p> <p>Apply the concepts of average and instantaneous rates of change of a function</p> <p>Demonstrate an understanding of the relationship between differentiability and continuity of a function</p>	<p>Use the definition of continuity to determine whether a function is continuous at a point or on an interval, chapt 1.3</p> <p>Find points of discontinuity for a function Ch. 1.3</p> <p>Verify the ITV for a specific function, p. 77</p> <p>Find the slope of a tangent line, chapter 2.1</p> <p>Write the equation of a tangent line, chapter 2.2, augment with applets demonstrating on the internet</p> <p>Compute the derivative of a function using the limit process, page 99</p> <p>Define the derivative of a function in a variety of ways including slope of the tangent line, rate of change of a function, and instantaneous velocity, chapter 2.2</p> <p>Calculate average and instantaneous rates of change of a function graphically and from a table, chapter 2.2</p> <p>Graphically examine the relationship between differentiability and continuity of a function, ch 2.2</p>	<p>Homework completion assessment, assessed homework</p> <p>Quizzes/tests</p> <p>Calculator problems</p>

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Differentiation (continued)	<p>Use differentiation to compute derivatives of functions</p> <p>Review of composite functions</p> <p>Use the Chain Rule to differentiate composite functions</p> <p>Find the derivative of implicitly-derived functions.</p> <p>Introduce the concept of second derivatives and higher order derivatives</p> <p>Emphasize the concept of derivative as slope</p>	<p>Students work problems in groups and individually</p> <p>Discussion with class, worked examples</p> <p>The chain rule is introduced, students work examples</p> <p>Compare explicit versus implicit functions, work out examples of explicitly derived functions, and find the derivatives P 141-142.</p> <p>Students compute successive derivatives of functions, p 119</p> <p>Begin introducing problems from old AP tests</p> <p>Use the derivative to find the slope of a curve and to write equations of tangent and normal lines to a curve, p. 127 # 77-79</p>	<p>Homework completion assessment, assessed homework</p> <p>Quizzes/tests</p> <p>Calculator problems</p>

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Applications of Differentiation (Continued)	<p>Introduce the second derivative test and inflection points</p> <p>Discuss global extrema versus relative extrema of functions</p> <p>Bring together the concepts learned so far to sketch the graph of a function</p>	<p>Use the second derivative test to determine intervals of concavity of a function and to locate inflection points, p. 192, 193; p. 194</p> <p>Use the second derivative test to analyze extrema of a function, p. 194</p> <p>Use information about intervals of increase and decrease, relative extrema, intervals of concavity, and inflection points to sketch the graph of a function. P. 167</p> <p>Use information about the derivative of a function to determine a sketch of the graph of the function and to determine the concavity of a function. P. 209-217</p> <p>Students complete several curve sketching problems in addition to book work to master the concept</p>	<p>Homework completion assessment, assessed homework</p> <p>Quizzes/tests</p> <p>Calculator problems</p> <p>Primary assessment is to demonstrate student mastery at sketching a function using calculus only and not a calculator</p>

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Applications of the derivation (continued)	<p>Create graphs of derivatives from functions</p> <p>Students calculate and examine limits at infinity</p> <p>Use derivatives to solve optimization problems</p> <p>Apply the derivative to solve problem situations involving speed, velocity, and acceleration</p> <p>Newton's method</p> <p>Differentials</p>	<p>Create the graph of a derivative and use it to interpret information about the function and its concavity, chapter 3.6</p> <p>Use the concept of limits at infinity to determine horizontal asymptotes of functions, chapter 3.5</p> <p>Students take word problems and transform them into mathematical problems in which they use calculus to optimize different values, chapter 3.7</p> <p>Students use differentiation to examine the relationship between speed, velocity, and acceleration. Teacher-provided examples from AP exams (nearly every year has an example), or from "Calculus camp" examples furnished by facilitators. Internet applications also work p. 229, google videos</p> <p>p. 235</p>	<p>Homework completion assessment, assessed homework</p> <p>Quizzes/tests</p> <p>Calculator problems</p> <p>Students apply numerical, graphical, and analytical approach to solving distance/velocity/acceleration problems in an assessed format.</p>

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<p>Knowledge, techniques, and theory behind integration (continued)</p>	<p>Students are introduced to the First Fundamental Theorem of Calculus</p> <p>Mean Value Theorem for Integrals</p> <p>Second Fundamental Theorem of Calculus</p> <p>Strategies for calculating more complicated antiderivatives</p> <p>Approximate the area under a curve with the Trapezoid Rule</p>	<p>Students use the limit of a Riemann sum to calculate a definite integral, ch 4.3</p> <p>Students use the First Fundamental Theorem of Calculus to evaluate definite integrals both manually and using the inherent capability on the TI-83 calculator, ch 4.4</p> <p>p. 285, google videos</p> <p>2nd FTC as taking the derivative of an integral, p. 289</p> <p>Google videos</p> <p>Students calculate antiderivatives using substitution of variables and change of limits, ch 4.5</p> <p>Beginning with a function defined over a domain, students use the Trapezoid rule to compute the area between the curve and the x-axis over a specified domain, ch 4.6, p. 311, students practice with AP Exam trapezoid rule problems</p>	<p>Homework completion assessment, assessed homework</p> <p>Quizzes/tests</p> <p>Calculator problems</p>

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<p>Knowledge and application of Logarithmic, Exponential, and Other Transcendental Functions</p>	<p>Review properties of the natural log function and the exponential function</p> <p>Definition of the natural log function</p> <p>Differentiation of exponential and logarithmic functions</p> <p>Review of Inverse functions and derivatives of inverse functions</p> <p>Students use logarithmic differentiation to find derivatives of complicated functions</p>	<p>Students graph and analyze the natural log and exponential functions, p. 325 chapt 5.1</p> <p>Students use TI-83 calculators to define the natural log function as the integral from 0 to x of $1/t$, dt, $t > 0$, p. 324</p> <p>Students learn and apply the rules to differentiate exponential and logarithmic functions, chapt 5.1</p> <p>Students create inverse functions, compare regular functions and inverses graphically. Students learn the rule to differentiate an inverse function and apply the rule, chapt 5.1</p> <p>Students work out examples/problems from the text, p. 531</p>	<p>Homework completion assessment, assessed homework</p> <p>Quizzes/tests</p> <p>Calculator problems</p>

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<p>Slope fields</p> <p>Differential equations, general and particular solutions</p> <p>Differential equations, growth and decay, the logistics function</p>	<p>Slope fields as graphs of general solutions of differential equations</p> <p>Slope fields as particular solutions of differential equations</p> <p>Creating a slope field from an equation</p> <p>Separation of variables technique</p> <p>Modeling growth and decay</p>	<p>Chapter 6.1, now slope field examples appear through the first 5 chapters, they are formally introduced in chapter 6. Many graphs are available at mathgraphs.com and these are used periodically throughout the curriculum</p> <p>There are some great slope field applets on the internet, one such site is at visualcalculus.org, there are many good “.edu” sites</p> <p>Finding the particular solution of a differential equation, p. 407 See examples at mathgraphs.com which is a site that goes with the text</p> <p>Chapt 6.2</p> <p>Chapt 6.2</p>	<p>Homework completion assessment, assessed homework</p> <p>Quizzes/tests</p> <p>Calculator problems</p> <p>Include slope fields as problems on quizzes</p>

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<p>Applications of integration</p> <ul style="list-style-type: none"> - Area under a curve - Find volume of solids of revolution via the Disk and washer method, and finding the cross sectional area of a solid with a base as the area between two curves <p>If time permits, the shell method is introduced</p>	<p>Use definite integrals to find the area of the region between curves</p> <p>Find the volume of a solid of revolution using both the disk method and the washer method</p> <p>Find the volume of a solid with known cross sections.</p> <p>Find the volume of a solid of revolution using the shell method</p> <p>Compare shell and disk method</p>	<p>Students manually calculate problems, and use graphing calculator capabilities to do similar calculations, chapt 7.1</p> <p>Given a fundamental set of data, students learn how to use the disk and washer method by following a checklist and doing problems. Ch 7.2 page 460, and google videos</p> <p>Given a fundamental set of data, students solve problems that result in the volume of a solid with known cross sections, p. 463, and google videos</p> <p>See applets on the internet. Good examples at visualcalculus.org</p> <p>p. 469 p. 473</p>	<p>Homework completion assessment, assessed homework</p> <p>Quizzes/tests</p> <p>Calculator problems</p>

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L'Hopital's rule for finding the limit	Indeterminate form L'hospital's rule	p. 63,85,200,214,569,572 p. 570. Review limits approaching infinity or 0, then practice with l'hospital's rule	Homework completion assessment, assessed homework Quizzes/tests Calculator problems