

**LITCHFIELD PUBLIC SCHOOLS**  
**Core Curriculum Scope and Sequence**  
**Calculus**

Essential Questions

- How do patterns and functions help us describe data and physical phenomena and solve a variety of problems?
- How are quantitative relationships represented by numbers?
- How do geometric relationships and measurements help us to solve problems and make sense of our world?
- How can collecting, organizing and displaying data help us analyze information and make reasonable predictions and informed decisions?

	CT Frameworks/Standards	Content and Skill Objectives Students will be able to:	Assessments	Resources
<b>UNIT 1</b>  <b>FUNCTIONS, LIMITS AND CONTINUITY</b>  <b>4 WEEKS</b>	CT(Extended) 1.1a - Students will model real world situations and make generalizations about mathematical relationships using a variety of patterns and functions. CT(Extended) 1.2a – Students will relate the behavior of functions and relations to specific parameters and determine functions to model real world situations. CT(Extended) 1.3a – Students will use and extend algebraic concepts to include real and complex numbers, vectors, and matrices.	<u><b>LIMITS</b></u> <ul style="list-style-type: none"> <li>• Define a limit in both non-mathematical and mathematical terms.</li> <li>• Evaluate one-sided limits.</li> <li>• Understand and express the relationship between right-handed and left-handed limits and the full limit.</li> <li>• Determine if a limit exists... <u><b>Algebraically</b></u> <ul style="list-style-type: none"> <li>• Apply properties of limits including rules for constants, rational functions, products, and composites.</li> <li>• Evaluate a limit by substitution.</li> <li>• Apply further methods of evaluation, such as factoring, simplifying, and conjugate multiplication when</li> </ul> </li> </ul>	<u><b>Formative Assessments Include:</b></u> Pre-Assessment Questioning Peer/self-evaluation Teacher observation Exercise sets  <u><b>Quizzes</b></u> Encompass at least one objective given throughout the unit. Administered depending on student need.  <u><b>Common Unit Assessment</b></u> – Assesses computation as well as critical thinking and problems	Textbook: Brief Calculus with Applications (4 <sup>th</sup> edition) – Larson, Hostetler, and Edwards  TI-84 Plus Graphing Calculator and SMARTBoard emulator  Teacher-made SMARTBoard presentations  <a href="http://www.calculus-help.com/tutorials">www.calculus-help.com/tutorials</a>

	<p>CT(Extended) 2.2a – Students will investigate mathematical properties and operations related to objects that are not numbers.</p> <p>CT(Extended) 3.3a – Use successive approximation, upper and lower bounds, and limits to solve measurement problems.</p> <p>CT(Extended) 4.1a – Students will model real world data graphically using appropriate tools, technology, and strategies.</p>	<p>substitution results in "<math>\frac{0}{0}</math>".</p> <p><u>Graphically</u></p> <ul style="list-style-type: none"> <li>• Recognize when a limit exists or does not exist when illustrated on a coordinate plane.</li> </ul> <p><u>Numerically</u></p> <ul style="list-style-type: none"> <li>• Determine a limit from a table of values.</li> </ul> <p><u>CONTINUITY</u></p> <ul style="list-style-type: none"> <li>• Define continuity of a function over a closed interval.</li> <li>• Define continuity of a function at a point.</li> <li>• Apply the properties of continuity.</li> <li>• Distinguish between removable and non-removable discontinuities</li> <li>• Examine functions with discontinuities both algebraically by applying the formal definition of continuity and graphically.</li> </ul>	<p>solving skills related to objectives covered in unit.</p>	
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<p style="text-align: center;">UNIT 2</p> <p style="text-align: center;">THE DERIVATIVE</p> <p style="text-align: center;">10 WEEKS</p>	<p>CT(Extended) 1.1a - Understand and use optimization strategies.</p> <p>CT(Extended) 1.2a - Recognize that the slope of the tangent line to a curve represents the rate of change.</p>	<ul style="list-style-type: none"> <li>• Determine the slope of a graph and calculate derivatives using the limit definition.</li> <li>• Recognize that the slope of the tangent line to a curve represents the instantaneous rate of change (vs. the slope of the secant line which represents average rate of change).</li> <li>• Use the power, product, quotient, and chain rules to determine the derivative of a function.</li> <li>• Apply derivatives to determine rates of change.</li> <li>• Calculate higher order derivatives.</li> <li>• Find derivatives of functions implicitly defined.</li> <li>• Define, explain, evaluate and graph the derivative of a function.</li> <li>• Use derivatives to determine equations of tangents to a curve, evaluate velocity and acceleration of objects, assess economic applications,</li> </ul>	<p><u>Formative Assessments Include:</u></p> <p>Pre-Assessment Questioning Peer/self-evaluation Teacher observation Exercise sets</p> <p><u>Quizzes</u> Encompass at least one objective given throughout the unit. Administered depending on student need.</p> <p><u>Common Unit Assessment</u> – Assesses computation as well as critical thinking and problems solving skills related to objectives covered in unit.</p>	<p>Textbook: Brief Calculus with Applications (4<sup>th</sup> edition) – Larson, Hostetler, and Edwards</p> <p>TI-84 Plus Graphing Calculator and SMARTBoard emulator</p> <p>Teacher-made SMARTBoard presentations</p> <p><a href="http://www.calculus-help.com/tutorials">www.calculus-help.com/tutorials</a></p>

		<p>and analyze the graphs of functions.</p> <ul style="list-style-type: none"><li>• Solve real-world problems in which related-rates are present using differentiation with respect to time.</li></ul>		
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<p style="text-align: center;">UNIT 3</p> <p style="text-align: center;">APPLICATIONS OF THE DERIVATIVE</p> <p style="text-align: center;">7 WEEKS</p>	<p>CT(Extended) 1.1a - Describe and compare properties and classes of functions, including exponential, polynomial, rational, logarithmic and trigonometric.</p> <p>CT(Extended) 1.1a - Analyze essential relations in a problem to determine possible functions that could model the situation.</p> <p>CT(Extended) 1.1a - Solve problems involving financial applications including compound interest, amortization of loans, and investments.</p> <p>CT(Extended) 1.2a - Relate the graphical representation of a function to its function family and find equations, intercepts, maximum or minimum values, asymptotes, and line of symmetry for that function.</p>	<ul style="list-style-type: none"> <li>• Determine and use critical numbers to establish open intervals in which a function is increasing or decreasing or equal to zero.</li> <li>• Understand and use the first derivative test and the extreme value theorem to determine relative and absolute extrema of a function.</li> <li>• Understand and use second derivatives to determine concavity and points of inflection of a graph.</li> <li>• Solve real-life optimization problems.</li> <li>• Use calculus (continuity, derivatives, extrema, concavity, points of inflection and asymptotes) to analyze the shape and sketch the graph of a function.</li> </ul>	<p><u>Formative Assessments Include:</u> Pre-Assessment Questioning Peer/self-evaluation Teacher observation Exercise sets</p> <p><u>Quizzes</u> Encompass at least one objective given throughout the unit. Administered depending on student need.</p> <p><u>Common Unit Assessment</u> – Assesses computation as well as critical thinking and problems solving skills related to objectives covered in unit.</p>	<p>Textbook: Brief Calculus with Applications (4<sup>th</sup> edition) – Larson, Hostetler, and Edwards</p> <p>TI-84 Plus Graphing Calculator and SMARTBoard emulator</p> <p>Teacher-made SMARTBoard presentations</p>

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<p>UNIT 4</p> <p>EXPONENTIAL AND LOGARITHMIC FUNCTIONS</p> <p>3 WEEKS</p>	<p>CT(Extended) 1.1a - Describe and compare properties and classes of functions, including exponential, polynomial, rational, logarithmic and trigonometric.</p> <p>CT(Extended) 1.1a - Analyze essential relations in a problem to determine possible functions that could model the situation.</p>	<ul style="list-style-type: none"> <li>• Determine the derivative of exponential and logarithmic functions.</li> <li>• Use calculus to solve exponential growth and decay problems.</li> </ul>	<p><u>Formative Assessments Include:</u> Pre-Assessment Questioning Peer/self-evaluation Teacher observation Exercise sets</p> <p><u>Quizzes</u> Encompass at least one objective given throughout the unit. Administered depending on student need.</p> <p><u>Common Unit Assessment</u> – Assesses computation as well as critical thinking and problems solving skills related to objectives covered in unit.</p>	<p>Textbook: Brief Calculus with Applications (4<sup>th</sup> edition) – Larson, Hostetler, and Edwards</p> <p>TI-84 Plus Graphing Calculator and SMARTBoard emulator</p> <p>Teacher-made SMARTBoard presentations</p>

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<p style="text-align: center;">UNIT 5</p> <p style="text-align: center;">INTEGRATION AND ITS APPLICATIONS</p> <p style="text-align: center;">9 WEEKS</p>	<p>CT(Core) 3.2a – Visualize three-dimensional objects</p> <p>CT(Extended) 3.3a - Use properties of similarity and techniques of trigonometry to make indirect measurements of lengths and angles to solve a variety of problems.</p>	<ul style="list-style-type: none"> <li>• Understand and determine antiderivatives.</li> <li>• Determine an indefinite integral and a particular solution to an integral.</li> <li>• Apply the concept of integration to real world situations including physics and economics-related applications.</li> <li>• Understand and apply the general power rule.</li> <li>• Determine then indefinite and definite integral of an exponential and logarithmic function.</li> <li>• Use the Fundamental Theorem of Calculus to determine the area between two graphs.</li> <li>• Apply the disc and washer methods to determine the volumes of solids of revolution.</li> </ul>	<p><u>Formative Assessments Include:</u></p> <p>Pre-Assessment Questioning Peer/self-evaluation Teacher observation Exercise sets</p> <p><u>Quizzes</u> Encompass at least one objective given throughout the unit. Administered depending on student need.</p> <p><u>Common Unit Assessment</u> – Assesses computation as well as critical thinking and problems solving skills related to objectives covered in unit.</p>	<p>Textbook: Brief Calculus with Applications (4<sup>th</sup> edition) – Larson, Hostetler, and Edwards</p> <p>TI-84 Plus Graphing Calculator and SMARTBoard emulator</p> <p>Teacher-made SMARTBoard presentations</p>

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<p>UNIT 6</p> <p>TECHNIQUES OF INTEGRATION</p> <p>3 WEEKS</p>	<p>CT(Extended) 1.1a - Apply the concept of limits to sequences and asymptotic behavior of functions.</p> <p>CT(Extended) 1.2a - Recognize that the slope of the tangent line to a curve represents the rate of change.</p>	<ul style="list-style-type: none"> <li>Analyze an integral to determine the appropriate technique of integration (substitution, by parts, or partial fractions)</li> </ul>	<p><u>Formative Assessments Include:</u></p> <p>Pre-Assessment Questioning Peer/self-evaluation Teacher observation Exercise sets</p> <p><u>Quizzes</u></p> <p>Encompass at least one objective given throughout the unit. Administered depending on student need.</p> <p><u>Common Unit Assessment</u> – Assesses computation as well as critical thinking and problems solving skills related to objectives covered in unit.</p>	<p>Textbook: Brief Calculus with Applications (4<sup>th</sup> edition) – Larson, Hostetler, and Edwards</p> <p>TI-84 Plus Graphing Calculator and SMARTBoard emulator</p> <p>Teacher-made SMARTBoard presentations</p>