

Course: Calculus

Teacher(s): Wilson

EQs for the year: How does mathematics relate to the physical world around us?

EUs for the year: Functions can be used to represent real situations and understand properties of those situations.

The big skill strands/genres prioritized in this course:

Differentiation, Integration, Real world application of derivatives and integrals

Grading categories and percentages that reflect these priorities:

Content: Sequences, Series and Limits (20% Fall), Instantaneous Rates of Change and Derivatives (20% Fall), Applications of Derivatives (10% Fall, 20% Spring), Advanced Derivatives (20% Spring), Integrals (10% Spring)

Mathematical Practice: Mathematical Initiative and Perseverance (20%), Mathematics Discussion and Argument Construction (20%), Mathematical Processing (10%)

Unit Essential Question/s & Unit time frame	Key Content	Key Skills	Common Core Learning Standards	Spiraled Skills/Content	Authentic summative performance task/s that frame the learning in unit.	Key formative & assessment opportunities for the skills and content along the way to performance task/s	Differentiated texts, resources, and tools
<p>September – October</p> <p>1st Unit</p> <p>Sequence, Series, and Limits</p> <p>• How can we add things we can't count ?</p>	<ul style="list-style-type: none"> • Zeno's Paradox • Finite and Infinite sequences • Arithmetic and geometric series • Sums of series • Convergent and divergent series • Limits 	<ul style="list-style-type: none"> • Identify a series as arithmetic, geometric or neither • Identify an infinite series as convergent or divergent • Use limit theorems to evaluate the limit of a polynomial function 	<p>Standards Covered:</p> <p>F-LE.1 F-LE.2 F-BF.1 F-BF.2 F-BF.3 A-SSE.2 A-APR.6</p> <p>Mathematical Practices:</p> <p>MP.1 MP.2 MP.7 MP.8</p>	<p>Spiraled Skills/Content:</p> <ul style="list-style-type: none"> • Asymptotes • Division by zero • Zero as an exponent • Operations with fractions • Order of operations <p>New skills/content for future units:</p> <ul style="list-style-type: none"> • Evaluating Limits 	<ul style="list-style-type: none"> • Unit Test 	<p>Diagnostic:</p> <ul style="list-style-type: none"> • Pre-Test <p>Formative:</p> <ul style="list-style-type: none"> • Classwork • Exit Slips • Class Discussion • Quizzes 	<p>Lessons draw on problems adapted from a variety of textbooks including:</p> <ul style="list-style-type: none"> • Cole, "Single Variable Calculus" • Dietiker, et al., "CPM Calculus" • Foerster, "Calculus: Concepts and Applications" • Holton & Pye "Creating Calculus" • Kelley, "The Humongous Book of Calculus Problems" • Stewart, "Single Variable Calculus" • Thompson, "Calculus made easy"

<p>October - November</p> <p>2nd Unit Instantaneous Rate of Change and Derivatives</p> <ul style="list-style-type: none"> • <i>What does a function look like up close?</i> • <i>How can we describe how quickly a function is changing?</i> • <i>How can we create a function for instantaneous rate of change?</i> 	<ul style="list-style-type: none"> • Rate of change • Average rate of change • Instantaneous rate of change • Limit definition of derivatives • Derivative rules for polynomials • Chain rule • Product rule • Quotient rule • Leibniz notation 	<ul style="list-style-type: none"> • Determine the average rate of change between two points on a function • Use limit notation to determine the instantaneous rate of change at a point • Use limit theorems to find the derivatives of various functions • Find derivatives of polynomials using the power rule • Use derivatives to determine the equation of a line tangent to a curve at a given point. 	<p>Standards Covered: F-IF.6 A-APR.5 A-REI.1 A-REI.10-12 F-IF.2 F-IF.2</p> <p>Mathematical Practices: MP.2 MP.3 MP.4</p>	<p>Spiraled Skills/Content:</p> <ul style="list-style-type: none"> • Evaluating Limits • Distributive, Associative, and Commutative Properties • Operations with fractions • Order of Operations • Negative and Rational Exponents <p>New skills/content for future units:</p> <ul style="list-style-type: none"> • Finding the instantaneous rate of change • Finding the slope of a tangent line • Derivative rules • Leibniz notation 	<ul style="list-style-type: none"> • Unit Test 	<p>Diagnostic:</p> <ul style="list-style-type: none"> • Pre-Test • Formative: • Classwork • Exit Slips • Class Discussion • Quizzes 	<p>Lessons draw on problems adapted from a variety of textbooks including:</p> <ul style="list-style-type: none"> • Cole, "Single Variable Calculus" • Dietiker, et al., "CPM Calculus" • Foerster, "Calculus: Concepts and Applications" • Holton & Pye "Creating Calculus" • Kelley, "The Humongous Book of Calculus Problems" • Stewart, "Single Variable Calculus" • Thompson, "Calculus made easy"
<p>December - February</p> <p>3rd Unit Applications of Derivatives</p> <ul style="list-style-type: none"> • <i>How can derivatives be used to understand the world around us?</i> 	<ul style="list-style-type: none"> • Second Derivative • Velocity, Acceleration, and Displacement • Critical points • Local and absolute extrema • Optimization 	<ul style="list-style-type: none"> • Use derivatives to find an object's velocity and acceleration. • Use derivatives to find the maximum and/or minimum points on a graph • Using derivatives, model real-life efficiency situations and maximize or minimize desired outcomes. 	<p>Standards Covered: A-CED.1 A-CED.2 A-CED.3 A-CED.4 A-REI.10-12 F-IF.7</p> <p>Mathematical Practices: MP.3 MP.4 MP.5 MP.6 MP.7</p>	<p>Spiraled Skills/Content:</p> <ul style="list-style-type: none"> • Finding the instantaneous rate of change • Finding the slope of a tangent line • Derivative rules <p>New skills/content for future units:</p> <ul style="list-style-type: none"> • Velocity, Acceleration, and Displacement • Second Derivatives • Antiderivatives 	<ul style="list-style-type: none"> • Unit Test • Project: Optimizing the packaging of a product. 	<p>Diagnostic:</p> <ul style="list-style-type: none"> • Pre-Test • Formative: • Classwork • Exit Slips • Class Discussion • Quizzes 	<p>Lessons draw on problems adapted from a variety of textbooks including:</p> <ul style="list-style-type: none"> • Cole, "Single Variable Calculus" • Dietiker, et al., "CPM Calculus" • Foerster, "Calculus: Concepts and Applications" • Holton & Pye "Creating Calculus" • Kelley, "The Humongous Book of Calculus Problems" • Stewart, "Single Variable Calculus" • Thompson, "Calculus made easy" <p>Additional Tools: Data Studio Software</p>

<p>March - May</p> <p>4th Unit Advanced Derivatives</p> <p>• <i>How can derivatives be used to understand more complicated situations?</i></p>	<ul style="list-style-type: none"> • Derivatives of logarithmic and exponential functions • Derivatives of trigonometric functions 	<ul style="list-style-type: none"> • Differentiate functions using implicit differentiation • Solve Related Rates problems 	<p>Standards Covered: F-BF.1 F-BF.5 F-TF.1 F-TF.3</p> <p>Mathematical Practices: MP.1 MP.2 MP.5</p>	<p>Spiraled Skills/Content:</p> <ul style="list-style-type: none"> • Derivative Rules • Trigonometry • Logarithmic and exponential functions • Velocity, Acceleration, and Displacement • Second Derivatives • Leibniz Notation <p>New skills/content for future units:</p> <ul style="list-style-type: none"> • Derivatives of logs, exponents, and trig functions 	<ul style="list-style-type: none"> • Unit Test 	<p>Diagnostic:</p> <ul style="list-style-type: none"> • Pre-Test • Formative: • Classwork • Exit Slips • Class Discussion • Quizzes 	<p>Lessons draw on problems adapted from a variety of textbooks including:</p> <ul style="list-style-type: none"> • Cole, "Single Variable Calculus" • Dietiker, et al., "CPM Calculus" • Foerster, "Calculus: Concepts and Applications" • Holton & Pye "Creating Calculus" • Kelley, "The Humongous Book of Calculus Problems" • Stewart, "Single Variable Calculus" • Thompson, "Calculus made easy"
<p>May – June</p> <p>5th Unit Integrals</p> <p>• <i>What does the area under a curve represent?</i></p> <p>• <i>How can we use integrals to model physical objects?</i></p>	<ul style="list-style-type: none"> • Riemann sums • Trapezoidal sums • Limit definition of integrals • Fundamental Theorem of Calculus • Volume of a solid of rotation 	<ul style="list-style-type: none"> • Evaluate the definite integral of a function using the fundamental theorem of calculus • Apply definite integrals to real world situations • Find the area between two curves using definite integrals • Interpret the results of definite integrals in terms of displacement or the amount a value has changed over a given interval • Find the volume of a solid by integrating a function 	<p>Standards Covered: F-IF.2 A-SSE.2 A-APR.6</p> <p>Mathematical Practices: MP.2 MP.7 MP.8</p>	<p>Spiraled Skills/Content:</p> <ul style="list-style-type: none"> • Antiderivatives • Volume • Derivatives of logs, exponents, and trig functions <p>New skills/content for future units:</p> <ul style="list-style-type: none"> • Fundamental Theorem of Calculus 	<ul style="list-style-type: none"> • Unit Test • Project: Designing and/or analyzing the volume of a real world solid of rotation 	<p>Diagnostic:</p> <ul style="list-style-type: none"> • Pre-Test • Formative: • Classwork • Exit Slips • Class Discussion • Quizzes 	<p>Lessons draw on problems adapted from a variety of textbooks including:</p> <ul style="list-style-type: none"> • Cole, "Single Variable Calculus" • Dietiker, et al., "CPM Calculus" • Foerster, "Calculus: Concepts and Applications" • Holton & Pye "Creating Calculus" • Kelley, "The Humongous Book of Calculus Problems" • Stewart, "Single Variable Calculus" • Thompson, "Calculus made easy" <p>Additional resources: http://curvebank.calstatela.edu/volrev/rev1cont.gif http://curvebank.calstatela.edu/volrev/rev3cont.gif</p>