

Shepard Preparatory High School
Calculus
Curriculum



Calculus completes the formal study of elementary functions begun in Algebra and Pre-Calculus. The conceptual building blocks of calculus are important for everyone to understand. How quantities such as world population change, how fast they change, and what will happen if they keep changing at the same rate are questions that can be discussed by students. Another important topic for all mathematics students is the concept of infinity - what happens as numbers get larger and larger and what happens as patterns continue indefinitely. Course topics include algebra, trigonometry, and analytic geometry. Students focus on the use of technology, modeling, and problem solving, and experience with graphing calculators is incorporated.

Unit 1

Functions and Limits

<u>Timeframe</u>	Week 1-7
<u>Unit Overview</u>	<ol style="list-style-type: none">1. A quantity is said to grow arbitrarily large if it can be made larger than any arbitrary number chosen to test it.2. A quantity may be said to approach a limiting value that is definitely determined, even though sometimes the quantity never reaches that value.3. All functions can be de-composed into the sum, difference, multiplication and division of the ten fundamental functions and therefore the graphs of which can be considered as the rigid or non-rigid transformation of the parent-graph.4. In order to find the slope of a tangent line or the instantaneous velocity the notation of a limit needs to be applied to a secant line.
<u>Essential Questions</u>	<ol style="list-style-type: none">1. How can you determine characteristics of function? (e.i even/odd, domain/range, the behavior of the graph).2. Given a function, how do you evaluate the difference quotient.3. What are the three requirements for continuity?4. How do you evaluate a limit algebraically?5. How do you evaluate a limit graphically?6. What does the intermediate value theorem state, how can it be applied, and why is it useful?
<u>Unit Focus</u>	<ul style="list-style-type: none">• Even/Odd Functions• Symmetry• Slope and rate of change• Domain and Range• Limit notation• Evaluate Trig functions• The Squeezing Theorem• The three ways that a limit can fail to exist• The Intermediate Value Theorem• The definitions of continuity
<u>Interdisciplinary Connections</u>	<ul style="list-style-type: none">• NJSL-9.4 Life Literacies and Key Skills
<u>Common Assessments</u>	<ul style="list-style-type: none">• Assessment Suite chapter quizzes and tests

Materials

Common Materials	Supplemental Materials
Glencoe PreCalculus by McGraw Hill Kuta Software Worksheets Khan Academy	Teacher created materials

New Jersey Student Learning Standards (NJSLS)

<u>Subject Area</u>	<u>Technology</u>	<u>21st Century Life and Careers</u>	<u>ELA Companion</u>
Mathematics	8.1: Educational Technology 8.2: Technology Education, Engineering, Design and Computational Thinking - Programming	NJSLS-9.4 Life Literacies and Key Skills	Secondary Science and Social Studies Only N/A
MP Mathematical Practice Standards for Mathematical Practice MP.1 Make sense of problems and persevere in solving them MP.2 Reason abstractly and quantitatively MP.4 Model with mathematics MP.5 Use appropriate tools strategically Functions F.IF.B. Interpreting Functions Interpret functions that arise in applications in terms of the context F.IF.B.4. For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and	NJ: 2020 SLS: Science NJ: Grades 9-12 HS-ETS1 Engineering Design Students who demonstrate understanding can: HS-ETS1-2. Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering. 9.3 – Career & Technical Education (CTE): Science, Technology, Engineering & Mathematics Career Cluster ® Career Cluster®: Science, Technology, Engineering & Mathematics (st)	• 9.4.2.CI.1: Demonstrate openness to new ideas and perspectives (e.g., 1.1.2.CR1a, 2.1.2.EH.1, 6.1.2.CivicsCM.2). • 9.4.2.CI.2: Demonstrate originality and inventiveness in work (e.g., 1.3A.2CR1a). • 9.4.2.CT.3: Use a variety of types of thinking to solve problems (e.g., inductive, deductive). 9.4.2.IML.1: Identify a simple search term to find information in a search engine or digital resource. 9.4.5.CI.1: Use appropriate communication technologies to collaborate with individuals with diverse perspectives about a local and/or global climate change issue and deliberate about possible	NJ: 2023 SLS: English Language Arts NJ: Grades 11-12 <ul style="list-style-type: none"> • Speaking and Listening Domain • Speaking and Listening

Calculus

<p>sketch graphs showing key features given a verbal description of the relationship. ★</p> <p>F.IF.B.6. Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph. ★</p> <p>F.TF.A. Trigonometric Functions Extend the domain of trigonometric functions using the unit circle</p> <p>F.TF.A.3. (+) Use special triangles to determine geometrically the values of sine, cosine, tangent for $\frac{\pi}{3}$, $\frac{\pi}{4}$, and $\frac{\pi}{6}$ and use the unit circle to express the values of sine, cosines, and tangent for $\pi-x$, $\pi+x$ and $2\pi-x$ in terms of their values for x, where x is any real number.</p> <p>F.TF.B. Trigonometric Functions Model periodic phenomena with trigonometric functions</p> <p>F.TF.B.7. (+) Use inverse functions to solve trigonometric equations that arise in modeling contexts; evaluate the solutions using technology, and interpret them in terms of the context. ★</p> <p>UNIT 1 Limits and Continuity</p> <p>BIG IDEA 2 Limits LIM</p> <p>How does knowing the value of a limit, or that a limit does not exist, help you to make sense of interesting features of functions and their graphs?</p> <p>TOPIC 1.3 Estimating Limit Values from Graphs</p> <p>LIM-1 Reasoning with definitions, theorems, and properties can be used to justify claims about limits.</p>	<p>9.3.ST.2 Use technology to acquire, manipulate, analyze and report data.</p> <p>Science & Mathematics Career Pathway (ST-SM)</p> <p>9.3.ST-SM.2 Apply science and mathematics concepts to the development of plans, processes and projects that address real world problems.</p> <ul style="list-style-type: none"> • 9.3 – Career & Technical Education (CTE): Science, Technology, Engineering & Mathematics Career Cluster ® • Engineering & Technology Career Pathway (ST-ET) 	<p>solutions (e.g., W.4.6, 3.MD.B.3,7.1.NM.IPERS.6).</p>	
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<p>LIM-1.C.2 Graphical information about a function can be used to estimate limits.</p> <p>TOPIC 1.5 Determining Limits Using Algebraic Properties of Limits LIM-1 Reasoning with definitions, theorems, and properties can be used to justify claims about limits</p> <p>LIM-1.D.2 Limits of sums, differences, products, quotients, and composite functions can be found using limit theorems.</p> <p>TOPIC 1.8 Determining Limits Using the Squeeze Theorem LIM-1 Reasoning with definitions, theorems, and properties can be used to justify claims about limits.</p> <p>LIM-1.E.2 The limit of a function may be found by using the squeeze theorem.</p> <p>TOPIC 1.10 Exploring Types of Discontinuities LIM-2 Reasoning with definitions, theorems, and properties can be used to justify claims about continuity.</p> <p>LIM-2.A Justify conclusions about continuity at a point using the definition.</p> <p>LIM-2.A.1 Types of discontinuities include removable discontinuities, jump discontinuities, and discontinuities due to vertical asymptotes.</p>			
<u>Differentiation</u>			
<p>Differentiation for Support and General Curriculum (504, ELL, Special Education, Struggling Learners)</p>	<p>Differentiation for Enrichment</p>		

<p>Modifications for Classroom: Pair visual prompts with verbal presentations Ask students to restate information, directions, and assignments Model skills / techniques to be mastered Extended time to complete class work Student-directed learning/ independent studies when appropriate</p> <p>Modifications for Homework and Assignments: Extended time to complete assignments Provide the student with clearly stated (written) expectations and grading criteria for assignments</p> <p>Modifications for Assessments: Extended time on classroom assessments</p>	<p>Use of higher level questioning techniques Provide assessments that require higher level thinking Increased production Substituting written texts with project-based learning Student-directed learning/ independent studies Extension activities</p> <p>Further Modifications for Honors Students Students in Honors courses, in addition to regular class assignments, will complete enrichment/extension activities outside of the regular class period. These assignments may be projects, labs, research papers, independent novel study, or other activities assigned by the teacher</p>
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Activities

Engaging mathematics learning activities include hands-on games, movement-based challenges, and creative projects that make abstract concepts tangible

Hands-on & Interactive Game Examples

- [Math War \(Cards\)](#): Students play with cards to practice multiplication or addition, trying to get the highest result.
- [Math Bingo](#): A fun way for students to practice multiplication, division, or addition in a group setting.
- [Dice Rolling Games](#): Roll dice to create and solve numbers, or use them to build shapes and towers.

Movement-Based Math

- [Math Scavenger Hunt](#): Hide numbers or equations around the room or outside for children to find
- [Math Relay Races](#): Students run to solve problems in teams, combining physical activity with mental calculation.
- [Human Number Line](#): Use body movement to represent positions on a number line, Walking number lines to demonstrate concepts like adding and subtracting negative numbers.

Creative & Visual Projects

- [Nature Sorting](#): Collecting leaves or sticks during a walk to practice sorting, sequencing, and measurement and probability.
- [Marshmallow Geometry](#): Using marshmallows and toothpicks to build 3D shapes.

Digital & Cognitive Activities

- [Virtual Manipulatives](#): Using online tools like geoboards or fraction bars.
- [Brain Teasers/Riddles](#): Daily puzzles that encourage logical thinking and problem-solving skills.
- [Virtual Escape Rooms](#): Engaging, technology-based puzzles for older students.

Unit 2

Derivatives

Timeframe

Week 8-19

Unit Overview

1. Associated with every function is a derivative function, which tell us the rate at which the function is changing.
2. Curves are generally associated with tangent lines, and, provided that they exist, a curve may have a particular tangent line associated with each point on the curve.
3. The value of a derivative is related to the increasing/decreasing behavior of the function.

Essential Questions

1. Is every function associated with a derivative function?
2. What can you say about a derivative based upon its graph?
3. What is the difference between an average rate and an instantaneous rate?
4. What are examples of things that have rates, other than things that have velocities? Are these rates related to derivatives of some sort?
5. How are the graphs of a function and its derivative related?

Unit Focus

- The definition of the derivative, in two forms
- The algebraic rules of differentiation
- Types of non-differentiable points
- Interpretations of derivatives: Slope; Velocity; Rate of change; Density

Interdisciplinary Connections

- NJSLS-9.4 Life Literacies and Key Skills

Common Assessments

- Assessment Suite chapter quizzes and tests

Materials

Common Materials

Glencoe PreCalculus by McGraw Hill

Supplemental Materials

Teacher created materials

New Jersey Student Learning Standards (NJSLs)

<p><u>Subject Area</u></p> <p>Mathematics</p>	<p><u>Technology</u></p>	<p><u>21st Century Life and Careers</u></p>	<p><u>ELA Companion</u></p>
<p>Geometry G.GMD.A. Geometric Measurement and Dimension Explain volume formulas and use them to solve problems G.GMD.A.3. Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems. ★ Functions F.BF.A. Building Functions Build a function that models a relationship between two quantities. ★ F.BF.A.1.b Write a function that describes a relationship between two quantities. b. Combine standard function types using arithmetic operations. F.IF.B. Interpreting Functions Interpret functions that arise in applications in terms of the context F.IF.B.6. Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph. ★ F.TF.A. Trigonometric Functions Extend the domain of trigonometric functions using the unit circle</p>	<p>NJ: 2020 SLS: Science NJ: Grades 9-12</p> <ul style="list-style-type: none"> • HS-ETS1 Engineering Design • Students who demonstrate understanding can: <p>HS-ETS1-2. Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.</p>	<ul style="list-style-type: none"> • 9.4.2.CI.1: Demonstrate openness to new ideas and perspectives (e.g., 1.1.2.CR1a, 2.1.2.EH.1, 6.1.2.CivicsCM.2). • 9.4.2.CI.2: Demonstrate originality and inventiveness in work (e.g., 1.3A.2CR1a). • 9.4.2.CT.3: Use a variety of types of thinking to solve problems (e.g., inductive, deductive). <p>9.4.2.IML.1: Identify a simple search term to find information in a search engine or digital resource. 9.4.5.CI.1: Use appropriate communication technologies to collaborate with individuals with diverse perspectives about a local and/or global climate change issue and deliberate about possible solutions (e.g., W.4.6, 3.MD.B.3, 7.1.NM.IPERS.6).</p>	<p>NJ: 2023 SLS: English Language Arts NJ: Grades 11-12</p> <ul style="list-style-type: none"> • Speaking and Listening Domain • Speaking and Listening

<p>F.TF.A.3. (+) Use special triangles to determine geometrically the values of sine, cosine, tangent for $\frac{\pi}{3}$, $\frac{\pi}{4}$, and $\frac{\pi}{6}$ and use the unit circle to express the values of sine, cosines, and tangent for $\pi-x$, $\pi+x$ and $2\pi-x$ in terms of their values for x, where x is any real number.</p>			
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Differentiation

Differentiation for Support and General Curriculum (504, ELL, Special Education, Struggling Learners)	Differentiation for Enrichment
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<p>Modifications for Classroom: Pair visual prompts with verbal presentations Ask students to restate information, directions, and assignments Model skills / techniques to be mastered Extended time to complete class work Student-directed learning/ independent studies when appropriate</p> <p>Modifications for Homework and Assignments: Extended time to complete assignments Provide the student with clearly stated (written) expectations and grading criteria for assignments</p> <p>Modifications for Assessments: Extended time on classroom assessments</p>	<p>Use of higher level questioning techniques Provide assessments that require higher level thinking Increased production Substituting written texts with project-based learning Student-directed learning/ independent studies Extension activities</p> <p>Further Modifications for Honors Students Students in Honors courses, in addition to regular class assignments, will complete enrichment/extension activities outside of the regular class period. These assignments may be projects, labs, research papers, independent novel study, or other activities assigned by the teacher</p>
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Activities

<p>Engaging mathematics learning activities include hands-on games, movement-based challenges, and creative projects that make abstract concepts tangible</p> <p>Hands-on & Interactive Game Examples</p> <ul style="list-style-type: none"> • Math War (Cards): Students play with cards to practice multiplication or addition, trying to get the highest result. • Math Bingo: A fun way for students to practice multiplication, division, or addition in a group setting. • Dice Rolling Games: Roll dice to create and solve numbers, or use them to build shapes and towers. <p>Movement-Based Math</p> <ul style="list-style-type: none"> • Math Scavenger Hunt: Hide numbers or equations around the room or outside for children to find 	
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<ul style="list-style-type: none"> • Math Relay Races: Students run to solve problems in teams, combining physical activity with mental calculation. • Human Number Line: Use body movement to represent positions on a number line, Walking number lines to demonstrate concepts like adding and subtracting negative numbers. <p>Creative & Visual Projects</p> <ul style="list-style-type: none"> • Nature Sorting: Collecting leaves or sticks during a walk to practice sorting, sequencing, and measurement and probability. • Marshmallow Geometry: Using marshmallows and toothpicks to build 3D shapes. <p>Digital & Cognitive Activities</p> <ul style="list-style-type: none"> • Virtual Manipulatives: Using online tools like geoboards or fraction bars. • Brain Teasers/Riddles: Daily puzzles that encourage logical thinking and problem-solving skills. • Virtual Escape Rooms: Engaging, technology-based puzzles for older students. 	
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Unit 3	
Applications of Differentiation	
<u>Timeframe</u>	Week 20-29
<u>Unit Overview</u>	<ol style="list-style-type: none"> 1. The first and second derivative are used to find all critical attributes of any given function. 2. Limits to infinity determine and behavior of functions. 3. Using a graphing calculator we can tackle curves that would be far too complicated to consider without technology. 4. Finding extreme values have practical applications in many areas of life, such a finding maximum area or minimizing cost.
<u>Essential Questions</u>	<ol style="list-style-type: none"> 1. What is Rolle's Theorem and how can it be applied? 2. What is the MVT and how can it be applied? 3. How do you find intervals of increasing and decreasing for any given function? 4. What are points of inflection and how do you find them? 5. How do you find intervals of concavity? 6. How do you evaluate a limit to infinity, and how is that solution applied to graph? 7. How can calculus be used to solve optimization problems?

<u>Unit Focus</u>	<ul style="list-style-type: none"> • Rolle's theorem and its application. • Mean Value Theorem and its application • Absolute VS. Relative Extrema • The use of limits to infinity • The First Derivative Test • The Second Derivative Test • Sketching a Curve 		
<u>Interdisciplinary Connections</u>	<ul style="list-style-type: none"> • NJSLS-9.4 Life Literacies and Key Skills 		
<u>Common Assessments</u>	<ul style="list-style-type: none"> • Assessment Suite chapter quizzes and tests 		
<u>Materials</u>			
Common Materials		Supplemental Materials	
Glencoe PreCalculus by McGraw Hill Kuta Software Worksheets Khan Academy		Teacher created materials	
<u>New Jersey Student Learning Standards (NJSLS)</u>			
<u>Subject Area</u>	<u>Technology</u>	<u>21st Century Life and Careers</u>	<u>ELA Companion</u>
F.IF.C. Interpreting Functions Analyze functions using different representations F.IF.C.7.d Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. ★ d. (+) Graph rational functions, identifying zeros and	NJ: 2020 SLS: Science NJ: Grades 9-12 HS-ETS1 Engineering Design Students who demonstrate understanding can: HS-ETS1-2. Design a solution to a complex	<ul style="list-style-type: none"> • 9.4.2.CI.1: Demonstrate openness to new ideas and perspectives (e.g., 1.1.2.CR1a, 2.1.2.EH.1, 6.1.2.CivicsCM.2). • 9.4.2.CI.2: Demonstrate originality and 	NJ: 2023 SLS: English Language Arts NJ: Grades 11-12 <ul style="list-style-type: none"> • Speaking and

Calculus

<p>asymptotes when suitable factorizations are available, and showing end behavior.</p> <p>F.TF.A. Trigonometric Functions Extend the domain of trigonometric functions using the unit circle</p> <p>F.TF.A.3. (+) Use special triangles to determine geometrically the values of sine, cosine, tangent for $\frac{\pi}{3}$, $\frac{\pi}{4}$, and $\frac{\pi}{6}$ and use the unit circle to express the values of sine, cosines, and tangent for $\pi-x$, $\pi+x$ and $2\pi-x$ in terms of their values for x, where x is any real number.</p>	<p>real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.</p> <p>9.3 – Career & Technical Education (CTE): Science, Technology, Engineering & Mathematics Career Cluster ®</p> <p>Career Cluster®: Science, Technology, Engineering & Mathematics (st)</p> <p>9.3.ST.2 Use technology to acquire, manipulate, analyze and report data.</p> <p>Engineering & Technology Career Pathway (ST-ET)</p> <p>9.3.ST-ET.5 Apply the knowledge learned in STEM to solve problems.</p> <p>Science & Mathematics Career Pathway (ST-SM)</p> <p>9.3.ST-SM.2 Apply science and mathematics concepts to the development of plans, processes and projects that address real world problems.</p> <p>9.3.ST-SM.3 Analyze the impact that science and mathematics has on society.</p>	<p>inventiveness in work (e.g., 1.3A.2CR1a).</p> <ul style="list-style-type: none"> 9.4.2.CT.3: Use a variety of types of thinking to solve problems (e.g., inductive, deductive). <p>9.4.2.IML.1: Identify a simple search term to find information in a search engine or digital resource.</p> <p>9.4.5.CI.1: Use appropriate communication technologies to collaborate with individuals with diverse perspectives about a local and/or global climate change issue and deliberate about possible solutions (e.g., W.4.6, 3.MD.B.3,7.1.NM.IPERS.6).</p>	<p>Listening Domain</p> <ul style="list-style-type: none"> Speaking and Listening
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Differentiation

Differentiation for Support and General Curriculum (504, ELL, Special Education, Struggling Learners)	Differentiation for Enrichment
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Calculus

<p>Extended time to complete assignments Provide the student with clearly stated (written) expectations and grading criteria for assignments</p> <p>Modifications for Assessments: Extended time on classroom assessments</p>	<p>Further Modifications for Honors Students Students in Honors courses, in addition to regular class assignments, will complete enrichment/extension activities outside of the regular class period. These assignments may be projects, labs, research papers, independent novel study, or other activities assigned by the teacher</p>
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Activities

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Unit 4

Integrals

<u>Timeframe</u>	Week 30-38
<u>Unit Overview</u>	<ol style="list-style-type: none"> 1. Mathematics offers a method for the computation of the area of any arbitrarily-shaped two-dimensional region, as long as that region is precisely described. 2. Differentiation and integration are inverse processes. Furthermore, the derivative and the integral, respectively, are analogs for division and multiplication. 3. Derivatives and integrals must be used in situations where a quantity changes in a continuous manner, rather than in a discrete manner.
<u>Essential Questions</u>	<ol style="list-style-type: none"> 1. If one knows the explicit expression for the derivative of a function, does that mean that one can find an explicit expression for the original function? 2. What limiting process can be used to calculate an area bounded by a specific curve? 3. How can the fundamental theorem of calculus be applied to find the area under the curve?
<u>Unit Focus</u>	<ul style="list-style-type: none"> • Fundamental Theorem of Calculus • Use of the Fundamental Theorem to evaluate definite integrals • Use of the Fundamental Theorem to represent a particular antiderivative, and the analytical and graphical analysis of functions so defined • Techniques of Antidifferentiation • Antiderivatives following directly from derivatives of basic functions • Antiderivatives by substitution of variables (including change of limits for definite integrals)
<u>Interdisciplinary Connections</u>	<ul style="list-style-type: none"> • NJSLS-9.4 Life Literacies and Key Skills
<u>Common Assessments</u>	<ul style="list-style-type: none"> • Assessment Suite chapter quizzes and tests
<u>Materials</u>	
Common Materials	Supplemental Materials
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New Jersey Student Learning Standards (NJSL)

<u>Subject Area</u>	<u>Technology</u>	<u>21st Century Life and Careers</u>	<u>ELA Companion</u>
<p>Functions</p> <p>F.TF.A. Trigonometric Functions Extend the domain of trigonometric functions using the unit circle</p> <p>F.TF.A.3. (+) Use special triangles to determine geometrically the values of sine, cosine, tangent for $\frac{\pi}{3}$, $\frac{\pi}{4}$, and $\frac{\pi}{6}$ and use the unit circle to express the values of sine, cosines, and tangent for $\pi-x$, $\pi+x$ and $2\pi-x$ in terms of their values for x, where x is any real number.</p> <p>NJ: 2020 SLS: Science</p> <p>NJ: Grades 9-12</p> <p>HS-ETS1 Engineering Design</p> <p>Students who demonstrate understanding can:</p> <p>HS-ETS1-2. Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering</p>	<p>NJ: 2020 SLS: Science</p> <p>NJ: Grades 9-12</p> <p>HS-ETS1 Engineering Design</p> <p>NJ: 2020 SLS: Computer Science & Design Thinking</p> <p>NJ: End of Grade 12</p> <p>8.1 Computer Science: Data & Analysis</p> <p>Individuals select digital tools and design automated processes to collect, transform, generalize, simplify, and present large data sets in different ways to influence how other people interpret and understand the underlying information.</p> <p>8.1.12.DA.1: Create interactive data visualizations using software tools to help others better understand real world phenomena, including climate change</p>	<ul style="list-style-type: none"> • 9.4.2.CI.1: Demonstrate openness to new ideas and perspectives (e.g., 1.1.2.CR1a, 2.1.2.EH.1, 6.1.2.CivicsCM.2). • 9.4.2.CI.2: Demonstrate originality and inventiveness in work (e.g., 1.3A.2CR1a). • 9.4.2.CT.3: Use a variety of types of thinking to solve problems (e.g., inductive, deductive). <p>9.4.2.IML.1: Identify a simple search term to find information in a search engine or digital resource.</p> <p>9.4.5.CI.1: Use appropriate communication technologies to collaborate with individuals with diverse perspectives about a local and/or global climate change issue and deliberate about possible solutions (e.g., W.4.6, 3.MD.B.3, 7.1.NM.IPERS.6).</p>	<p>NJ: 2023 SLS: English Language Arts</p> <p>NJ: Grades 11-12</p> <ul style="list-style-type: none"> • Speaking and Listening Domain • Speaking and Listening

Differentiation

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<u>Activities</u>	
<p>Engaging mathematics learning activities include hands-on games, movement-based challenges, and creative projects that make abstract concepts tangible</p> <p>Hands-on & Interactive Game Examples</p> <ul style="list-style-type: none"> • <u>Math War (Cards)</u>: Students play with cards to practice multiplication or addition, trying to get the highest result. • <u>Math Bingo</u>: A fun way for students to practice multiplication, division, or addition in a group setting. • <u>Dice Rolling Games</u>: Roll dice to create and solve numbers, or use them to build shapes and towers. <p>Movement-Based Math</p> <ul style="list-style-type: none"> • <u>Math Scavenger Hunt</u>: Hide numbers or equations around the room or outside for children to find • <u>Math Relay Races</u>: Students run to solve problems in teams, combining physical activity with mental calculation. • <u>Human Number Line</u>: Use body movement to represent positions on a number line, Walking number lines to demonstrate concepts like adding and subtracting negative numbers. <p>Creative & Visual Projects</p>	

<ul style="list-style-type: none"> • Nature Sorting: Collecting leaves or sticks during a walk to practice sorting, sequencing, and measurement and probability. • Marshmallow Geometry: Using marshmallows and toothpicks to build 3D shapes. <p>Digital & Cognitive Activities</p> <ul style="list-style-type: none"> • Virtual Manipulatives: Using online tools like geoboards or fraction bars. • Brain Teasers/Riddles: Daily puzzles that encourage logical thinking and problem-solving skills. • Virtual Escape Rooms: Engaging, technology-based puzzles for older students. 	
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Unit 5	
Applications of Integration	
<u>Timeframe</u>	Week 39-40
<u>Unit Overview</u>	In Unit 4 we defined and calculated areas of regions that lie under the graphs of functions. Here we use integrals to find areas of regions that lie between the graphs of two functions.
<u>Essential Questions</u>	<ol style="list-style-type: none"> 1. What does the area between two curves tell use about two cards driving side by side along road? 2. How would you use calculus to find the are between two curves? 3. How did people ever find the exact value for the volume of a sphere? 4. Is it possible to form two entirely different sums by slicing a region in two different directions? 5. What cross-sectional shape would be revealed if a cube were sliced by a plane perpendicular to the body-diagonal?
<u>Unit Focus</u>	<ul style="list-style-type: none"> • Area • Volume • Slicing diagrams • Methods of disk, washer, and shell • Average value of a function • Mean Value Theorem in a new form (the integral form)
<u>Interdisciplinary Connections</u>	<ul style="list-style-type: none"> • NJSL-9.4 Life Literacies and Key Skills

<u>Common Assessments</u>		<ul style="list-style-type: none"> Assessment Suite chapter quizzes and tests 	
<u>Materials</u>			
Common Materials		Supplemental Materials	
Glencoe PreCalculus by McGraw Hill Kuta Software Worksheets Khan Academy		Teacher created materials	
<u>New Jersey Student Learning Standards (NJSL)</u>			
<u>Subject Area</u>	<u>Technology</u>	<u>21st Century Life and Careers</u>	<u>ELA Companion</u>
Mathematics	<i>8.1: Educational Technology 8.2: Technology Education, Engineering, Design and Computational Thinking - Programming</i>	<i>Career Ready Practices 9.1: Personal Financial Literacy 9.2: Career Awareness, Exploration, and Preparation</i>	<i>Secondary Science and Social Studies Only</i>
			N/A
Standards for Mathematical Practice MP.1 Make sense of problems and persevere in solving them MP.2 Reason abstractly and quantitatively MP.8 Look for and express regularity in repeated reasoning	NJ: 2020 SLS: Science NJ: Grades 9-12 <ul style="list-style-type: none"> HS-ETS1 Engineering Design Students who demonstrate understanding can: HS-ETS1-2. Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.	<ul style="list-style-type: none"> 9.4.2.CI.1: Demonstrate openness to new ideas and perspectives (e.g., 1.1.2.CR1a, 2.1.2.EH.1, 6.1.2.CivicsCM.2). 9.4.2.CI.2: Demonstrate originality and inventiveness in work (e.g., 1.3A.2CR1a). 9.4.2.CT.3: Use a variety of types of thinking to solve problems (e.g., inductive, deductive). 9.4.2.IML.1: Identify a simple search term to find information in a search engine or digital resource. 9.4.5.CI.1: Use appropriate communication technologies to collaborate with individuals with diverse perspectives about a local 	NJ: 2023 SLS: English Language Arts NJ: Grades 11-12 <ul style="list-style-type: none"> Speaking and Listening Domain Speaking and Listening

		and/or global climate change issue and deliberate about possible solutions (e.g., W.4.6, 3.MD.B.3,7.1.NM.IPERS.6).	
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Differentiation

Differentiation for Support and General Curriculum (504, ELL, Special Education, Struggling Learners)	Differentiation for Enrichment
<p>Modifications for Classroom: Pair visual prompts with verbal presentations Ask students to restate information, directions, and assignments Model skills / techniques to be mastered Extended time to complete class work Student-directed learning/ independent studies when appropriate</p> <p>Modifications for Homework and Assignments: Extended time to complete assignments Provide the student with clearly stated (written) expectations and grading criteria for assignments</p> <p>Modifications for Assessments: Extended time on classroom assessments</p>	<p>Use of higher level questioning techniques Provide assessments that require higher level thinking Increased production Substituting written texts with project-based learning Student-directed learning/ independent studies Extension activities</p> <p>Further Modifications for Honors Students Students in Honors courses, in addition to regular class assignments, will complete enrichment/extension activities outside of the regular class period. These assignments may be projects, labs, research papers, independent novel study, or other activities assigned by the teacher</p>

Activities

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Hands-on & Interactive Game Examples

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Movement-Based Math

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Creative & Visual Projects

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