

Marking Period: 3	Unit Title: Applications of Derivatives	Recommended Instruction Days: 15-20
Standard-New Jersey Student Learning Standards: F-IF, F-BF		
<p>Strand: F-IF: Interpreting Functions Understand the concept of a function and use function notation 2. Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.</p> <p>Interpret functions that arise in applications in terms of the context 4. For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. 5. Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.</p> <p>F-BF: Building Functions Build a function that models a relationship between two quantities 1. Write a function that describes a relationship between two quantities a. Compose functions</p> <p>Build new functions from existing functions 3. Identify the effect on the graph replacing $f(x)$ by $f(x) + k$, $kf(x)$, and $f(x + k)$ for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology.</p>		
<p>LGBT and Disabilities Law: <i>N.J.S.A. 18A:35-4.35</i></p> <p>James B. Pollack - American astrophysicist who worked for NASA's Ames Research Center.</p> <p>The mission is to ensure that every student is able to see themselves in our rich and diverse history.</p>		
<p>Social and Emotional Learning: <i>Competencies</i></p>	<p>Social and Emotional Learning: <i>Sub-Competencies</i></p>	

<p>Self-Awareness</p> <p>Social Awareness</p> <p>Self-Management</p> <p>Relationship Skills</p> <p>Responsible Decision-Making</p>	<ul style="list-style-type: none"> ● Recognizing the importance of self-confidence in handling daily tasks and challenges. ● Demonstrate an awareness of the expectations for social interactions in a variety of ways. ● Demonstrate an understanding of the need for mutual respect when viewpoints differ. ● Recognize the skills needed to establish and achieve personal and educational goals. ● Utilize positive communication and social skills to interact effectively with others. ● Develop, implement, and model effective problem solving and critical thinking skills.
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Recommended Activities, Investigations, Interdisciplinary Connections, and/or Student Experiences to Explore NJSLM-M within Unit

Essential Questions	Progress Indicators	Activity Description
<ul style="list-style-type: none"> ● How does one use the derivative to solve optimization problems? ● How do derivatives help solve real-world problems? ● What is L'Hôpital's rule? ● How are average and instantaneous velocity connected? 	<ul style="list-style-type: none"> ● Tests ● Quizzes ● Practice problems for homework ● Worksheets ● Leveled assessments ● Projects 	<ul style="list-style-type: none"> ❖ Straight-line Motion ❖ Related Rates ❖ L'Hôpital's Rule ❖ Optimization Theory ❖ Mean Value Theorem ❖ Extreme Values ❖ Second Derivative Test ❖ Example Tasks Below <p style="text-align: center;">Interdisciplinary Connections:</p> <p style="text-align: center;">Personal Financial Literacy: Planning, Saving, and Investing</p> <p>Fenway Park holds about 38,000 spectators. Suppose that the average ticket costs \$100 (there are different tiers to the ticket prices), and that at that price, the average attendance throughout the season is 25,000. Now suppose the Boston Red Sox</p>

conduct a poll and find that for each drop in average ticket price of \$10, average attendance would increase by 1,000.

- Find the average price p as a linear function of average attendance x .
- The revenue generated by selling x tickets is $R(x) = xp(x)$. Use your answer to part (a) to help you determine the average ticket price that will yield maximum revenue.

Answer

- $p(x) = 350 - (x/100)$
- $p(17,500) = \$175$

Task

Perform the following derivative with respect to x .

$$\frac{d^2}{dx^2}(2x^6)$$

Answer

$$\frac{dy}{dx} = \frac{d}{dx} 2x^6 = 12x^5$$

$$\frac{d^2y}{dx^2} = \frac{d}{dx} \left(\frac{dy}{dx} \right) = \frac{d}{dx} (12x^5) = 60x^4$$

Task

Find the (a) absolute maximum and (b) absolute minimum x -values on $f(x) = x^3 - 3x + 1$ on the interval $[0,3]$.

Answer

- $x = 3$
- $x = 1$

Mathematical Practices		
<ol style="list-style-type: none"> 1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics. 5. Use appropriate tools strategically. 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning. 		
Assessments (Formative) <i>To show evidence of meeting the standard/s, students will successfully engage within:</i>	Assessments (Summative) <i>To show evidence of meeting the standard/s, students will successfully complete:</i>	
<u>Formative Assessment:</u> <ul style="list-style-type: none"> ● Entry and Exit Slips ● Quizzes 	<u>Benchmarks:</u> <ul style="list-style-type: none"> ● Chapter Tests ● Projects 	

<ul style="list-style-type: none"> ● Self Assessments ● Focus Packets 	<p align="center"><u>Summative Assessments:</u></p> <ul style="list-style-type: none"> ● District assessments 		
<p align="center">Differentiated Student Access to Content: Teaching and Learning <i>Resources/Materials</i></p>			
<p align="center">Core Resources</p>	<p align="center">Alternate Core Resources <i>IEP/504/At-Risk/ESL</i></p>	<p align="center">ELL Core Resources</p>	<p align="center">Gifted & Talented Core Resources</p>
<p>online albert resource online achievethecore resource online learnzillion resource online khanacademy resource online desmos resource online edulastic resource</p>	<p>Reteaching worksheets Skill building workbook Math manipulatives Leveled practice worksheets</p>	<p>Dictionary for native language Video tutorial in native language Success for English Learners worksheets Leveled Strategies for English Learners Linguistic Support</p>	<p>Enrichment worksheets Art of Problem Solving Leveled assessments</p>
<p align="center">Supplemental Resources</p>			
<ul style="list-style-type: none"> ● Technology: Chromebooks, Graphing Calculators, Smartboards, ● Other: Zoom and Google Meets, Schoology, Google Classroom 			
<p align="center">Differentiated Student Access to Content: Recommended <i>Strategies & Techniques</i></p>			

Core Resources	Alternate Core Resources <i>IEP/504/At-Risk/ESL</i>	ELL Core Resources	Gifted & Talented Core Resources
<p>Deliver instruction utilizing varied learning styles including audio, visual, and tactile/kinesthetic, provide individual instruction as needed, modify assessments and/or rubrics, repeat</p>	<p>Utilize a multi-sensory (VAKT) approach during instruction, provide alternate presentations of skills by varying the method (repetition, simple explanations, additional examples, modeling, etc.), modify test content and/or format, allow students to retake test for additional credit, provide additional times and preferential seating as needed, review, restate and repeat directions, provide study guides, and/or break assignments into segments of shorter tasks.</p>	<p>Extend time requirements, preferred seating, positive reinforcement, check often for understanding/review, oral/visual directions/prompts when necessary, supplemental materials including use of an online bilingual dictionary, and modified assessment and/or rubric.</p>	<p>Create an enhanced set of introductory activities, integrate active teaching/learning opportunities, incorporate authentic components, propose interest-based extension activities, and connect student to related</p>