Marking Period: 2	Unit Title: Derivative Rules	Recommended Instruction Days: 20 -25

Standard-New Jersey Student Learning Standards: F-IF, F-BF

Strand:

F-IF: Interpreting Functions

Understand the concept of a function and use function notation

1. Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then f(x) denotes the output of f corresponding to the input x. The graph of f is the graph of the equation y = f(x).
2. Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.

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.

Analyze functions using different representations

7. Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.
    a. Graph linear and quadratic functions and show intercepts, maxima, and minima
    b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.
    c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.
    d. Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.
    e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.

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

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.

LGBT and Disabilities Law: *N.J.S.A. 18A:35-4.35*

Dr. Jessica Esquivel - Physicist, Data Analyst, Science Communicator, and second-ever Black woman to receive her physics Ph.D from Syracuse University.

The mission is to ensure that every student is able to see themselves in our rich and diverse history.

Social and Emotional Learning: ***Competencies***	**Social and Emotional Learning:** ***Sub-Competencies***
Self-Awareness Social Awareness Self-Management Relationship Skills Responsible Decision-Making	• 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.

Recommended Activities, Investigations, Interdisciplinary Connections, and/or Student Experiences to Explore NJSLS-CLKS within Unit

Essential Questions	**Progress Indicators**	**Activity Description**
• What are the various rules for	• Tests	❖ Derivatives of Polynomials

differentiation and how do we apply them? ● Does applying algebraic operatives change the derivatives of a function? ● What is the implicit function and how do you find the derivative of an implicit function?	● Quizzes ● Practice problems for homework ● Worksheets ● Leveled assessments ● Projects	❖ Power Rule ❖ Product Rule ❖ Quotient Rule ❖ Chain Rule ❖ Derivatives of Trig Functions ❖ Derivatives of Exponentials ❖ Derivatives of Logarithms ❖ Second Derivative ❖ Example Tasks Below **Interdisciplinary Connections:** **Personal Financial Literacy: Credit and Debt Management** Suppose a student takes out a student loan with a yearly interest rate of r %. Let C =f(r) be the total cost (in $) of repaying that loan. a. What does f(0.05) = $10,000 mean? b. What are the units f'(0.05)? What would f'(0.05) = $1,000 mean? c. Do you expect f'(r) to be positive for all r >0 or negative? Briefly explain your answer. **Answer** a. The total cost of repaying a 5% interest rate student loan is $10,000. b. Units: $ per percent interest; interpretation: When the interest rate of a student loan is 5%, the total cost of repayment is increasing at the instantaneous rate of $1,000 per percent interest. c. Positive, because as r increases so does the repayment cost. **Task** Differentiate f(x) = 3x + 5 **Answer** f'(x) = $\frac{d}{dx}(3x + 5)$

		$3\frac{d}{dx}(x) + 5\frac{d}{dx}(1)$ $3(1) + 5(0) = 3$ **Task** Differentiate $h(x) = \frac{x+1}{x}$ **Answer** $h'(x) = \frac{(x+1)'(x) - (x+1)(x)'}{x^2}$ $= \frac{1(x) - (x+1)(1)}{x^2} = -\frac{1}{x^2}$

Mathematical Practices

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) ***To show evidence of meeting the standard/s, students will successfully engage within:***	**Assessments (Summative)** ***To show evidence of meeting the standard/s, students will successfully complete:***
Formative Assessment: ● Entry and Exit Slips ● Quizzes ● Self Assessments ● Focus Packets	**Benchmarks:** ● Chapter Tests ● Projects **Summative Assessments:** ● District assessments

Differentiated Student Access to Content:
Teaching and Learning *Resources/Materials*

Core Resources	**Alternate Core Resources** ***IEP/504/At-Risk/ESL***	**ELL Core Resources**	**Gifted & Talented Core Resources**
online albert resource online achievethecore resource online learnzillion resource online khanacademy resource online desmos resource online edulastic resource	Reteaching worksheets Skill building workbook Math manipulatives Leveled practice worksheets	Dictionary for native language Video tutorial in native language Success for English Learners worksheets Leveled Strategies for English Learners	Enrichment worksheets Art of Problem Solving Leveled assessments

		Linguistic Support	

Supplemental Resources

- Technology: Chromebooks, Graphing Calculators, Smartboards,
- Other: Zoom and Google Meets, Schoology, Google Classroom

Differentiated Student Access to Content:
Recommended *Strategies & Techniques*

Core Resources	**Alternate Core Resources** ***IEP/504/At-Risk/ESL***	**ELL Core Resources**	**Gifted & Talented Core Resources**
Deliver instruction utilizing varied learning styles including audio, visual, and tactile/kinesthetic, provide individual instruction as needed, modify assessments and/or rubrics, repeat	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.	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.	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