Unit Title: Limits and Their Models

Stage 1: Desired Results

Standards & Indicators:

- F-IF.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).
- F-IF.2. Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.
- F-IF.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. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.★
- F-IF.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-IF.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-IF.8. Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. a. Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context. b. Use the properties of exponents to interpret expressions for exponential functions. For example, identify percent rate of change in functions such as y = (1.02)t, y = (0.97)t, y = (1.01)12t, y = (1.2)t/10, and classify them as representing exponential growth or decay.
- F-IF.9. Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum

Career Readiness, Life Literacies and Key Skills				
Standard	Performance Expectations		Core Ideas	
9.4.12.Cl.1	Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g.1.1.12prof.CR3a).		With a growth mindset, failure is an important part of success.	
9.4.12.GCA.1	Collaborate with individuals to analyze a variety of potential solutions to climate change effects and determine why some solutions (e.g., political. economic, cultural) may work better than others (e.g., SL.11-12.1., HS-ETS1-1, HS-ETS1-2, HS-ETS1-4, 6.3.12.GeoGI.1, 7.1.IH.IPERS.6,		Solutions to the problems faced by a global society require the contribution of individuals with different points of view and experiences.	
9.4.12.CT.1	Identify problem-solving strategies used in the development of an innovative product or practice (e.g., 1.1.12acc.C1b, 2.2.12.PF.3).		Collaboration with individuals with diverse experiences can aid in the problem-solving process, particularly for global issues where diverse solutions are needed.	
Central Idea/Enduring Une	derstanding:	Essential/Guiding Que	estion:	
Differentiate between a prol using Pre- Calculus and Ca	blem that can be solved lculus.	What is the definition of Calculus?		
Interpret mathematical mod	lels for real life data			
Develop and use strategies	for finding limits	What is a tangent line and how is it basic to Calculus?		
		How can you use the A	rea Problem?	
		What is a limit?		
		What are two behaviors	associated with nonexistent limits?	
		What are the properties	of continuity?	
		What is the Intermediat	e value theorem?	
		What is an asymptote?		
		What are the properties of infinite limits?		
<u>Content</u> :		Skills(Objectives):		
Function Notation		Test for symmetry w/respect to axis and origin		
Limits Properties of Continuity Intermediate Value Theorem Squeeze Theorem		Find the points of intersection of two graphs		
		Use function notation		
		Determine continuity at interval	t a point and continuity on an open	
		Determine one sided lin	nits and continuity on a closed interval	

	Use properties of continuity	
	Understand and use the intermediate value theorem	
	Determine the infinite limits from the left and from the right	
	Find and sketch the vertical asymptote of the graph of a function	
	Find domain and range	
	Identify transformations	
	Classify functions	
	Approximate area under a curve	
	Estimate a limit using a numerical or graphical approach	
	Learn the formal definition of a limit	
	Evaluate a limit using properties of limits	
	Develop and use strategies for finding limits	
	Evaluate a limit using dividing out and rationalizing techniques	
	Evaluate a limit using the squeeze Theorem	
Interdisciplinary Connections:		
Interdisciplinary connections are integrated in each unit with connections to the mathematical practices.		
 Make sense of problems and persevere in solving them Reason abstractly and quantitatively Construct viable arguments and critique the reasoning of others 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

Stage 2: Assessment Evidence

Performance Task(s):	Other Evidence:
F.IF.A.2 http://tasks.illustrativemathematics.org/content -standards/HSF/IF/A/2/tasks/664	Written and Online Assignments Exit Cards Mid Chapter Quizzes End of Chapter Assessments
F.IF.9	

http://tasks.illustrativemathematics.org/content		
-standards/HSF/IF/C/9/tasks/1279		
Stage	3: Learning Plan	
Learning Opportunities/Strategies:	Resources:	
Turn and talk	Calculus, Graphical, Numerical, Algebraic, 4th Edition, Finney, Demana, Waits, Kennedy	
Student driven activities	Delta math Edulastic	
Think, Pair, Share strategy	Kahoot Classkick	
Small group collaboration	Khan Academy Lesson Presentations and Videos	
Videos/apps when appropriate	Graphing Calculator Desmos Google Apps for Education LGBT and Disabilities Resources: • LGBTQ-Inclusive Lesson & Resources by Garden State Equality and Make it Better for Youth • LGBTQ+ Books	
	 DEI Resources: Learning for Justice GLSEN Educator Resources Supporting LGBTQIA Youth Resource List Respect Ability: Fighting Stigmas, Advancing Opportunities NJDOE Diversity, Equity & Inclusion Educational Resources Diversity Calendar 	

Differentiation

*Please note: Teachers who have students with 504 plans that require curricular accommodations are to refer to Struggling and/or Special Needs Section for differentiation

High-Achieving	On Grade Level	Struggling Students	Special Needs/ELL
Students	Students		
Khan Academy	Tutoring	Provide a highly	Any student requiring further
Project based learning	Tables	structured, predictable	accommodations and/or modifications
Tablets	Graphic organizers	learning environment	will have them individually listed in
Challenging problems	Differentiation of	Provide	their 504 Plan or IEP. These might
with higher degree of	learning strategies:	organizers/study	include, but are not limited to:
difficulty	visual, auditory,	guides	breaking assignments into smaller
Higher order thinking	kinetic and	Lessons designed to	tasks, giving directions through
questions	cooperative	the style of learning	several channels (auditory, visual,
Differentiation of pacing	Technology	that matches the	kinesthetic, model), and/or small
and activities	connection	student	group instruction for reading/writing
Differentiation of learning	Practice Assignments	Cooperative Learning	
strategies: visual,	Puzzle time activities	Positive reinforcement	ELL supports should include, but are
auditory, kinetic and	Record and practice	Announce test with	not limited to, the following::
cooperative	journal	adequate prep time	Extended time

Enrichment and extension	Differentiating the	Lessons presentation	Provide visual aids
Technology connection	lesson activities	available on google	Repeated directions
Practice assignments	Lesson tutorials	classroom	Differentiate based on proficiency
Puzzle time activities	Skills review	Frequent check for	Provide word banks
Record and practice	handbook	understanding	Allow for translators, dictionaries
journal		Break down task into	
		manageable units	
		One-on-one	
		instruction	
		Tutoring	
		Pair student with a	
		high achieving	
		student	

Unit Title: Differentiation

Stage 1: Desired Results

Standards & Indicators:

- N-Q.1. Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.
- N-Q.2. Define appropriate quantities for the purpose of descriptive modeling
- N-Q.3. Choose a level of accuracy appropriate to limitations on measurement when reporting quantities
- A-REI.3 Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.
- A-CED.1. Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions.
- A-CED.2. Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
- A-CED.3 Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.
- A-CED.4. Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. For example, rearrange Ohm's law V = IR to highlight resistance R.

A-REI.11. Explain why the x-coordinates of the points where the graphs of the equations y = f(x) and y = g(x) intersect are the solutions of the equation f(x) = g(x); find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations.

Include cases where f(x) and/or g(x) are linear, polynomial, rational, absolute value, exponential, and logarithmic functions

F-BF.1. (a,b,c) Write a function that describes a relationship between two quantities.★ a. Determine an explicit expression, a recursive process, or steps for calculation from a context. b. Combine standard function types using arithmetic operations. For example, build a function that models the temperature of a cooling body by adding a constant function to a decaying exponential, and relate these functions to the model. c. (+) Compose functions. For example, if T(y) is the temperature in the atmosphere as a function of height, and h(t) is the height of a weather balloon as a function of time, then T(h(t)) is the temperature at the location of the weather balloon as a function of time.

Career Readiness, Life Literacies and Key Skills				
Standard	Performance Expectations		Core Ideas	
9.4.12.Cl.1	Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a).		With a growth mindset, failure is an important part of success.	
9.4.12.CT.1	Identify problem-solving strategies used in the development of an innovative product or practice (e.g., 1.1.12acc.C1b, 2.2.12.PF.3).		Collaboration with individuals with diverse experiences can aid in the problem-solving process, particularly for global issues where diverse solutions are needed.	
9.4.12.GCA.1	Collaborate with individuals to analyze a variety of potential solutions to climate change effects and determine why some solutions (e.g., political. economic, cultural) may work better than others (e.g., SL.11-12.1., HS-ETS1-1, HS-ETS1-2, HS-ETS1-4, 6.3.12.GeoGI.1, 7.1.IH.IPERS.6, 7.1 II. IPERS.7, 8.2.12, ETW(3)		Solutions to the problems faced by a global society require the contribution of individuals with different points of view and experiences.	
Central Idea/Enduring Understanding:		Essential/Guiding Que	estion:	
Understand the relationship between differentiability and continuity.		What is the definition of What are the four notat	the derivative of a function?	
Understand how to distingu written in explicit and implic	iish between functions cit form	What is continuity and why is it important in differentiation?		
Understand how to use implicit differentiation to find the derivative of a function		What is the relationship between position, velocity and acceleration?		
Understand the definition of extrema of a function on an interval		Name some other real life examples that involve rates of change.		
Understand Relative extrema of a function on an		What is the difference b difference b	etween explicit and implicit	
open interval Understand and use -Rolle's Theorem -The mean value theorem		How can the change of another?	f one variable depend on the change of	

F-IF.2. . Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context

	How can you find if a function has a maximum or minimum value?
	How can you find the maximum or minimum of a function?
	How can you decide if a function is increasing or decreasing?
	How can you decide where a function changes direction?
	What does a concave up function tell you that that function has?
	What is a horizontal Asymptote?
	What are some of the tools used to define the sketch of a function?
Content:	Skills(Objectives):
Derivative of functions Explicit and implicit form Related Rates	Find the slope of the tangent line to a curve at a point
Differentiation rules Rolle's Theorem	Use the limit definition to find the derivative of a function
Mean Value Theorem Increasing and decreasing functions First and second derivative tests Differentials	Find the derivative of a function using the constant rule, the power rule, the constant multiple rule, the sum and difference rules
	Find the derivative of a trigonometric function
	Find a higher order derivative of a function
	Find the derivative of a composite function using the chain rule
	Find the derivative of a function using the general power rule
	Simplify the derivative of a function using algebra
	Find the derivative of a trigonometric function using the chain rule
	Distinguish between functions written in explicit and implicit form
	Use implicit differentiation to find the derivative of a function

	Find a related rate to solve real life problems	
	Determine intervals on which a function is increasing or	
	decreasing	
	Apply the first derivative test to find relative extreme of a	
	function	
	luiction	
	Determine intervals on which a function is concave up or	
	concave down	
	Find any points of inflection of the graph of a function	
	Apply the second Derivative test to find relative extrema of a	
	function	
	Analyze and skatch the graph of Pational function Padical	
	function -Polynomial function -Trigonometric function	
	Tuletion - Foryholmar function - Higoholmetric function	
	Solve applied minimum and maximum problems	
	11 1	
	Understand the concept of a tangent line approximation	
	Compare the value of the differential, With the actual change in	
	у,	
	Tind the differential of a function using differentiation formation	
Interdisciplinen: Connections:	rind the differential of a function using differentiation formulas	
Interdisciplinary connections are integrated in each unit with connections to the 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

Stage 2: Assessment Evidence Performance Task(s): Other Evidence: A.CED. 2 Written and Online Assignments http://tasks.illustrativemathematics.org/content Exit Cards -standards/HSA/CED/A/2/tasks/1215 Mid Chapter Quizzes N.Q.2 End of Chapter Assessments

http://tasks.illustrativemathematics.org/content -standards/HSN/Q/A/2/tasks/83		
Stage	3: Learning Plan	
Learning Opportunities/Strategies:	Resources:	
Turn and talk	Calculus, Graphical, Numerical, Algebraic, 4th Edition, Finney, Demana, Waits, Kennedy Delta math	
Student driven activities	Edulastic	
Think, Pair, Share strategy	Classkick Khan Academy	
Small group collaboration	Lesson Presentations and Videos Granbing Calculator	
Videos/apps when appropriate	Graphing Calculator Desmos Google Apps for Education	
	 LGBT and Disabilities Resources: LGBTQ-Inclusive Lesson & Resources by Garden State Equality and Make it Better for Youth LGBTQ+ Books 	
	 DEI Resources: Learning for Justice GLSEN Educator Resources Supporting LGBTQIA Youth Resource List Respect Ability: Fighting Stigmas, Advancing Opportunities NJDOE Diversity, Equity & Inclusion Educational Resources Diversity Calendar 	

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Project based learning	Tables	structured, predictable	accommodations and/or modifications
Tablets	Graphic organizers	learning environment	will have them individually listed in
Challenging problems	Differentiation of	Provide	their 504 Plan or IEP. These might
with higher degree of	learning strategies:	organizers/study	include, but are not limited to:
difficulty	visual, auditory,	guides	breaking assignments into smaller
Higher order thinking	kinetic and	Lessons designed to	tasks, giving directions through
questions	cooperative	the style of learning	several channels (auditory, visual,
Differentiation of pacing	Technology	that matches the	kinesthetic, model), and/or small
and activities	connection	student	group instruction for reading/writing
Differentiation of learning	Practice Assignments	Cooperative Learning	
strategies: visual,	Puzzle time activities	Positive reinforcement	ELL supports should include, but are
auditory, kinetic and	Record and practice	Announce test with	not limited to, the following::
cooperative	journal	adequate prep time	Extended time

Enrichment and extension Technology connection Practice assignments Puzzle time activities Record and practice journal	Differentiating the lesson activities Lesson tutorials Skills review handbook	Lessons presentation available on google classroom Frequent check for understanding Break down task into manageable units One-on-one instruction Tutoring Pair student with a high achieving student	Provide visual aids Repeated directions Differentiate based on proficiency Provide word banks Allow for translators, dictionaries
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Unit Title: Integration

Stage 1: Desired Results

Standards & Indicators:

N-Q.1 Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. (R)

N-Q.2 Define appropriate quantities for the purpose of descriptive modeling (

N-Q.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities

A-REI.3. . Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.

F-IF.8 (a,b) Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. a. Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context. b. Use the properties of exponents to interpret expressions for exponential functions. For example, identify percent rate of change in functions such as y = (1.02)t, y = (0.97)t, y = (1.01)12t, y = (1.2)t/10, and classify them as representing exponential growth or decay.

F-IF.9 Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.

F-BF.1. (a,b,c) Write a function that describes a relationship between two quantities. \star a. Determine an explicit expression, a recursive process, or steps for calculation from a context. b. Combine standard function types using arithmetic operations. For example, build a function that models the temperature of a cooling body by adding a constant function to a decaying exponential, and relate these functions to the model. c. (+) Compose functions. For example, if T(y) is the temperature in the atmosphere as a function of height, and h(t) is the height of a weather balloon as a function of time, then T(h(t)) is the temperature at the location of the weather balloon as a function of time.

F-BF.3. Identify the effect on the graph of replacing f(x) by f(x) + k, k f(x), f(kx), 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. Include recognizing even and odd functions from their graphs and algebraic expressions for them.

F-BF.5. Understand the inverse relationship between exponents and logarithms and use this relationship to solve problems involving logarithms and exponents.

F-TF.1. Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle.

F-TF.2. Explain how the unit circle in the coordinate plane enables the extension of trigonometric functions to all real numbers, interpreted as radian measures of angles traversed counterclockwise around the unit circle

F-TF.3. Use special triangles to determine geometrically the values of sine, cosine, tangent for $\in/3$, $\in/4$ and $\in/6$, and use the unit circle to express the values of sine, cosine, and tangent for $\in-x$, $\in+x$, and $2\in-x$ in terms of their values for x, where x is any real number

F-TF.4 Use the unit circle to explain symmetry (odd and even) and periodicity of trigonometric functions. Model periodic phenomena with trigonometric functions

F-TF.5. Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline.★

F-TF.6. (+) Understand that restricting a trigonometric function to a domain on which it is always increasing or always decreasing allows its inverse to be constructed.

F-TF.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. \star

Career Readiness, Life Literacies and Key Skills			
Standard	Performance	Expectations	Core Ideas
9.4.12.Cl.1	Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a).		With a growth mindset, failure is an important part of success.
9.4.12.CT.1	Identify problem-solving strategies used in the development of an innovative product or practice (e.g., 1.1.12acc.C1b, 2.2.12.PF.3).		Collaboration with individuals with diverse experiences can aid in the problem-solving process, particularly for global issues where diverse solutions are needed.
9.4.12.GCA.1	Collaborate with individuals to analyze a variety of potential solutions to climate change effects and determine why some solutions (e.g., political. economic, cultural) may work better than others (e.g., SL.11-12.1., HS-ETS1-1, HS-ETS1-2, HS-ETS1-4, 6.3.12.GeoGI.1, 7.1.IH.IPERS.6, 7.1.IL.IPERS.7, 8.2.12.ETW.3).		Solutions to the problems faced by a global society require the contribution of individuals with different points of view and experiences.
Central Idea/Enduring Understanding:		Essential/Guiding Que	estion:
Understand the concept of area		What is an antiderivative?	
Understand the definition of a Riemann sum		Why is it called "an" ant antiderivative?	iderivative instead of "the'

Understand the use of the mean value theorem for	What is sigma notation?
Integrais	What practical application would use the area of a region
The area of a region between two curves	between two curves?
Volume using the disc method.What is the definition of a solid of revolution?	
	How is the washer method an extension of the disc method?
<u>Content</u> :	Skills(Objectives): Write the general solution of a differential equation
Antiderivatives and Indefinite Integration Riemann Sums and Definite Integrals The Fundamental Theorem of Calculus	Use the indefinite integral notation for antiderivatives
Integration by substitution and numerical integration	Use basic integration rules to find Antiderivatives
Trapezoid Rule Area	Find a particular solution of a differential equation
	Evaluate a definite integral Unit
	Use sigma notation to write and evaluate a sum
	Understand the concept of area
	Approximate the area of a plane region
	Find the area of a plane region using limits Evaluate a definite integral (using limits and using properties of definite integrals)
	Use pattern recognition to find an indefinite integral
	Use change of variables to find and indefinite integral
	Use the general power rule for integration to find an indefinite integral
	Use a change of variables to evaluate a definite integral
	Evaluate a definite integral involving an even or odd function
	Approximate a definite integral -Using the Trapezoidal rule -Using the Simpson's rule
	Analyze the approximate errors in the in the Trapezoidal rule and the Simpson's rule using the fundamental theorem of calculus
	Use the mean value theorem for integrals

a closed interval			
tal theorem of			
ves			
using the disc method and with known cross			
ting curves using			
actices.			
Stage 3: Learning Plan			
, 4th Edition, Finney,			
Edulastic			
Classkick Khan Acadomy			

 LGBT and Disabilities Resources: LGBTQ-Inclusive Lesson & Resources by Garden State Equality and Make it Better for Youth LGBTQ+ Books
DEI Resources:
 Learning for Justice GLSEN Educator Resources Supporting LGBTQIA Youth Resource List Respect Ability: Fighting Stigmas, Advancing Opportunities NJDOE Diversity, Equity & Inclusion Educational Resources Diversity Calendar

Differentiation *Please note: Teachers who have students with 504 plans that require curricular accommodations are to refer to Struggling and/or Special Needs Section for differentiation

High-Achieving	On Grade Level	Struggling Students	Special Needs/ELL
Students	Students		
Students Khan Academy Project based learning Tablets Challenging problems with higher degree of difficulty Higher order thinking questions Differentiation of pacing and activities Differentiation of learning strategies: visual, auditory, kinetic and cooperative Enrichment and extension Technology connection Practice assignments Puzzle time activities Record and practice journal	StudentsTutoring TablesGraphic organizersDifferentiation of learning strategies: visual, auditory, kinetic and cooperativeTechnology connectionPractice AssignmentsPuzzle time activities Record and practice journalDifferentiating the lesson activities Lesson tutorialsSkills review handbook	Provide a highly structured, predictable learning environment Provide organizers/study guides Lessons designed to the style of learning that matches the student Cooperative Learning Positive reinforcement Announce test with adequate prep time Lessons presentation available on google classroom Frequent check for understanding Break down task into manageable units One-on-one instruction Tutoring Pair student with a high achieving student	Any student requiring further accommodations and/or modifications will have them individually listed in their 504 Plan or IEP. These might include, but are not limited to: breaking assignments into smaller tasks, giving directions through several channels (auditory, visual, kinesthetic, model), and/or small group instruction for reading/writing ELL supports should include, but are not limited to, the following:: Extended time Provide visual aids Repeated directions Differentiate based on proficiency Provide word banks Allow for translators, dictionaries

<u>Unit Title</u>: Logarithmic, Exponential, and Other Transcendental Functions

Stage 1: Desired Results

Standards & Indicators:

N-Q.1. Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.

N-Q.2. Define appropriate quantities for the purpose of descriptive modeling.

N-Q.3. Choose a level of accuracy appropriate to limitations on measurement when reporting quantities

A-REI.3 Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.

F-BF.4. (a-d) Find inverse functions. a. Solve an equation of the form f(x) = c for a simple function f that has an inverse and write an expression for the inverse. For example, $f(x) = 2 \times 3$ or f(x) = (x+1)/(x-b. (+) Verify by composition that one function is the inverse of another. c. (+) Read values of an inverse function from a graph or a table, given that the function has an inverse. d. (+) Produce an invertible function from a non-invertible function by restricting the domain.

F-BF.5. Understand the inverse relationship between exponents and logarithms and use this relationship to solve problems involving logarithms and exponents

F-TF.1 Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle.

F-TF.2. Explain how the unit circle in the coordinate plane enables the extension of trigonometric functions to all real numbers, interpreted as radian measures of angles traversed counterclockwise around the unit circle.

F-TF.3. (+) Use special triangles to determine geometrically the values of sine, cosine, tangent for \notin /3, \notin /4 and \notin /6, and use the unit circle to express the values of sine, cosine, and tangent for \notin -x, \notin +x, and $2\notin$ -x in terms of their values for x, where x is any real number.

F-TF.4. (+) Use the unit circle to explain symmetry (odd and even) and periodicity of trigonometric functions.

F-TF.5 Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline.

F-TF.6. (+) Understand that restricting a trigonometric function to a domain on which it is always increasing or always decreasing allows its inverse to be constructed.

F-TF.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.

Career Readiness, Life Literacies and Key Skills				
Standard	Performance Expectations		Core Ideas	
9.4.12.Cl.1	Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a).		With a growth mindset, failure is an important part of success.	
9.4.12.CT.1	Identify problem-solving strategies used in the development of an innovative product or practice (e.g., 1.1.12acc.C1b, 2.2.12.PF.3).		Collaboration with individuals with diverse experiences can aid in the problem-solving process, particularly for global issues where diverse solutions are needed.	
9.4.12.GCA.1	Collaborate with individuals to analyze a variety of potential solutions to climate change effects and determine why some solutions (e.g., political. economic, cultural) may work better than others (e.g., SL.11-12.1., HS-ETS1-1, HS-ETS1-2, HS-ETS1-4, 6.3.12.GeoGI.1, 7.1.IH.IPERS.6, 7.1 II. JPERS.7, 8.2.12 ETW (2)		Solutions to the problems faced by a global society require the contribution of individuals with different points of view and experiences.	
Central Idea/Enduring Un	derstanding:	Essential/Guiding Que	estion:	
Develop and use properties of the natural logarithmic function		What is e and how big is it? What is the difference between log and ln?		
Understand the definition of the number e Find derivative of functions involving the natural logarithmic function		What is an inverse func	tion?	
Use the log rule for integral to integrate a rational function Integrate trigonometric functions				
Content:		Skills(Objectives):		
The Natural Logarithmic Function Inverse functions Exponential functions Bases other than e and applications Differential equations Inverse trigonometric functions		Define exponential fund Differentiate and integr bases other than e. Use exponential function exponential growth Use separation of varial equation	etions that have bases other than e rate exponential functions that have ons to model compound interest and bles to solve a simple differential	

	Use exponential functions to model growth and decay in applied problems
	Resolve and solve differential equations that can be solved by separation of variables
	Recognize and solve homogeneous differential equations
	Develop properties of the six inverse trigonometric function
	Differentiate an inverse trigonometric function
	Review the basic differentiation rules for elementary functions
Interdisciplinary Connections:	
Interdisciplinary connections are integrated in each u	init with connections to the mathematical practices.
 Make sense of problems and persevere in solving Reason abstractly and quantitatively Construct viable arguments and critique the reaso Model with mathematics Use appropriate tools strategically 	them ning of others
6 Attend to precision	
7 Look for and make use of structure	
7. LOOK IN ANU MARE use of structure	sing .
o. Look for and express regularity in repeated reason	iing
Stago 2: /	Assossment Evidence
Stage 2: A	Assessment Evidence
Stage 2: A Performance Task(s):	Assessment Evidence Other Evidence:
Stage 2: A Performance Task(s):	Assessment Evidence Other Evidence: Written and Online Assignments
Stage 2: A Performance Task(s): <u>F. BF. 4</u>	Assessment Evidence Other Evidence: Written and Online Assignments Exit Cards
Stage 2: A Performance Task(s): <u>F. BF. 4</u> <u>http://tasks.illustrativemathematics.org/content-sta</u>	Assessment Evidence Other Evidence: Written and Online Assignments Exit Cards Mid Chapter Quizzes
Stage 2: A Performance Task(s): <u>F. BF. 4</u> <u>http://tasks.illustrativemathematics.org/content-sta</u> <u>ndards/HSF/BF/B/4</u>	Assessment Evidence Other Evidence: Written and Online Assignments Exit Cards Mid Chapter Quizzes End of Chapter Assessments
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Stage 2: A Performance Task(s): F. BF. 4 http://tasks.illustrativemathematics.org/content-sta ndards/HSF/BF/B/4 Stage Learning Opportunities/Strategies:	Assessment Evidence Other Evidence: Written and Online Assignments Exit Cards Mid Chapter Quizzes End of Chapter Assessments End of Unit Common Assessments 3: Learning Plan Resources:
Stage 2: A Performance Task(s): F. BF. 4 http://tasks.illustrativemathematics.org/content-sta ndards/HSF/BF/B/4 Stage Learning Opportunities/Strategies:	Assessment Evidence Other Evidence: Written and Online Assignments Exit Cards Mid Chapter Quizzes End of Chapter Assessments End of Unit Common Assessments S: Learning Plan Resources: Calculus, Graphical, Numerical, Algebraic, 4th Edition, Finney,
Performance Task(s): F. BF. 4 http://tasks.illustrativemathematics.org/content-sta ndards/HSF/BF/B/4 Stage Learning Opportunities/Strategies: Turn and talk	Assessment Evidence Other Evidence: Written and Online Assignments Exit Cards Mid Chapter Quizzes End of Chapter Assessments End of Unit Common Assessments S: Learning Plan Resources: Calculus, Graphical, Numerical, Algebraic, 4th Edition, Finney, Demana, Waits, Kennedy
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Performance Task(s): F. BF. 4 http://tasks.illustrativemathematics.org/content-sta ndards/HSF/BF/B/4 Stage Learning Opportunities/Strategies: Turn and talk Student driven activities	Assessment Evidence Other Evidence: Written and Online Assignments Exit Cards Mid Chapter Quizzes End of Chapter Assessments End of Unit Common Assessments 3: Learning Plan Resources: Calculus, Graphical, Numerical, Algebraic, 4th Edition, Finney, Demana, Waits, Kennedy Delta math Edulastic
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		 LGBTQ+ Books 	<u> </u>
LGBTQ+ Books DEI Resources: Learning for Justice GLSEN Educator Re Supporting LGBTQI/ Respect Ability: Figh Opportunities NJDOE Diversity, Eco Resources Diversity Calendar			stice or Resources 3TQIA Youth Resource List Fighting Stigmas, Advancing ty, Equity & Inclusion Educational dar
Differentiation	have students with 504		
*Please note: leachers who have students with 504 plans that require curricular accommodations are to refer to			
Struggling and/or Special Needs Section for differentiation		<u> </u>	
High-Achieving	On Grade Level	Struggling Students	Special Needs/ELL
Students	Students		
Khan Academy	Tutoring	Provide a highly	Any student requiring further
Project based learning	Tables	structured, predictable	accommodations and/or modifications
Tablets	Graphic organizers	learning environment	will have them individually listed in
Challenging problems	Differentiation of	Provide	their 504 Plan or IEP. These might
with higher degree of	learning strategies:	organizers/study	include, but are not limited to:
difficulty	visual, auditory,	guides	breaking assignments into smaller
Higher order thinking	kinetic and	Lessons designed to	tasks, giving directions through
questions	cooperative	the style of learning	several channels (auditory, visual,
Differentiation of pacing	Technology	that matches the	kinesthetic, model), and/or small
and activities	connection	student	group instruction for reading/writing
Differentiation of learning	Practice Assignments	Cooperative Learning	

and activities Differentiation of learning strategies: visual, auditory, kinetic and cooperative Enrichment and extension Technology connection Practice assignments Puzzle time activities Record and practice journal	connection Practice Assignments Puzzle time activities Record and practice journal Differentiating the lesson activities Lesson tutorials Skills review handbook	student Cooperative Learning Positive reinforcement Announce test with adequate prep time Lessons presentation available on google classroom Frequent check for understanding Break down task into manageable units One-on-one instruction	group instruction for reading/writing ELL supports should include, but are not limited to, the following:: Extended time Provide visual aids Repeated directions Differentiate based on proficiency Provide word banks Allow for translators, dictionaries
		manageable units One-on-one instruction Tutoring Pair student with a high achieving student	

Calculus Honors	Calculus, Graphical, Numerical, Algebraic, Fourth Edition	Standards
UNIT 1	CHAPTERS	F-IF.1
Limits and Their Models	1: (11 Days)	F-IF.2
(22 Days)	2: (11 Days)	F-IF.4
		F-1F.6-9
UNIT 2	CHAPTERS	N-Q.1-3
Differentiation	3: (10 Days)	A-REI.3
(22 Days)	4: (12 Days)	A-CED.1-4.
		A-RELII
		F.BF. I FIF 2
		1.11. 2
UNIT 3	CHAPTERS	N-Q.1-3
Integration	5: (22 Days)	A-REI.3
System (22 Days)		A-REI.11
		F.IF. 8-9 EDE 1
		F.DF. 1 F BF 3
		F.BF.5
		F.TF. 1-7
UNIT 4	CHAPTERS	N-Q.1-3
Logarithmic, Exponential,	6: (11 Days)	A.REI.3
and Other Transcendental	7: (11 Days)	F.BF.4-5
Functions		F.TF. 1-7
(22 Days)		