Calculus Honors

Unit Title: **Unit 1: Limits and Their Models**

Stage 1: Desired Results

Standards & Indicators:

F.IF.A.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.A.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.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 sketch graphs showing key features given a verbal description of the relationship

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.IF.C.7- Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.

F.IF.C.8- Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function

F.IF.C.9-Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tab

Integration of Climate Change

- F.IF.A.2 Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.
  Climate Change Example: Students may use function notation to determine the amount of carbon dioxide produced by burning a given number of molecules of ethane (gasoline), m, where c(m) is the number of molecules of carbon dioxide.
- 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. ★
  Climate Change Example: Students may calculate the average rate of change of a function c(m) presented symbolically or as a table, where c(m) represents the amount of carbon dioxide produced by burning a given number of molecules of ethane (gasoline).

Career Readiness, Life Literacies and Key Skills

Standard	Performance Expectations	Core Ideas
9.4.12.CI.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, .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.

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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 Understanding: Differentiate between a problem that can be solved using Pre- Calculus and Calculus. Interpret mathematical models for real life data Develop and use strategies for finding limits	**Essential/Guiding Question:** What is the definition of Calculus? How does Calculus compare to Precalculus? What is a tangent line and how is it basic to Calculus? How can you use the Area Problem? What is a limit? What are two behaviors associated with nonexistent limits? What are the properties of continuity? What is the Intermediate value theorem? What is an asymptote? What are the properties of infinite limits?
Content: Function Notation Limits Properties of Continuity Intermediate Value Theorem Squeeze Theorem	**Skills(Objectives):** Test for symmetry w/respect to axis and origin Find the points of intersection of two graphs Use function notation Determine continuity at a point and continuity on an open interval Determine one sided limits 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

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	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.
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:
F.IF.A.2 http://tasks.illustrativemathematics.org/content-standards/HSF/IF/A/2/tasks/664 F.IF.9 http://tasks.illustrativemathematics.org/content-standards/HSF/IF/C/9/tasks/1279	Written and Online Assignments Exit Cards Mid Chapter Quizzes End of Chapter Assessments

Stage 3: Learning Plan

Learning Opportunities/Strategies:	Resources:
Turn and talk Student driven activities Think, Pair, Share strategy Small group collaboration Videos/apps when appropriate	Calculus, Graphical, Numerical, Algebraic, 4th Edition, Finney, Demana, Waits, Kennedy Delta math Pear Assessment Classkick Khan Academy Lesson Presentations and Videos 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

Calculus Honors

	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 Students	On Grade Level Students	Struggling Students	Special Needs/ELL
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	Tutoring Tables Graphic organizers Differentiation of learning strategies: visual, auditory, kinetic and cooperative Technology connection Practice Assignments Puzzle time activities Record and practice journal Differentiating the lesson activities Lesson tutorials Skills 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

Unit Title: Unit 2: **Differentiation**

Stage 1: Desired Results

Standards & Indicators:

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

Calculus Honors

N-QA.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.

A-CED.4. Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.

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

F.BF.A.1-Write a function that describes a relationship between two quantities.

Integration of Climate Change

- N.Q.A.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.
  Climate Change Example: Students may use units to guide the solution of multi-step problems about how variations in the flow of energy into and out of the Earth's systems result in climate change. Note: Changes in climate are limited to changes in surface temperatures, precipitation patterns, glacial ice volumes, sea levels, and biosphere distribution.
- N.Q.A.2 Define appropriate quantities for the purpose of descriptive modeling.
  Climate Change Example: Students may define appropriate quantities for a descriptive model of how variations in the flow of energy into and out of Earth's systems result in climate change. Note: changes in climate are limited to changes in surface temperatures, precipitation patterns, glacial ice volumes, sea levels, and biosphere distribution.
- N.Q.A.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
  Climate Change Example: Students may, when reporting quantities related to how variations in the flow of energy into and out of the Earth's systems result in climate change, choose a level of accuracy appropriate to limitations on how quantities were measured.
- A.CED.A.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.
  Climate Change Example: Students may create equations and/or inequalities to represent the economic impact of climate change.
- A.CED.A.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.
  Climate Change Example: Students may represent constraints describing the economic impact of climate change by equations, inequalities, and/or by systems of inequalities, and interpret solutions as viable or nonviable options.

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- A.CED.A.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.
  Climate Change Example: Students may rearrange formulas related to the economic impact of climate change to highlight a quantity of interest, using the same reasoning as in solving equations.
- F.IF.A.2 Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.
  Climate Change Example: Students may use function notation to determine the amount of carbon dioxide produced by burning a given number of molecules of ethane (gasoline), m, where c(m) is the number of molecules of carbon dioxide.

Career Readiness, Life Literacies and Key Skills

Standard	Performance Expectations	Core Ideas
9.4.12.CI.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:

Understand the relationship between differentiability and continuity.

Understand how to distinguish between functions written in explicit and implicit form

Understand how to use implicit differentiation to find the derivative of a function

Understand the definition of extrema of a function on an interval

Understand Relative extrema of a function on an open interval

Understand and use -Rolle's Theorem -The mean value theorem

Essential/Guiding Question:

What is the definition of the derivative of a function?

What are the four notations used for derivatives?

What is continuity and why is it important in differentiation?

What is the relationship between position, velocity and acceleration?

Name some other real life examples that involve rates of change.

What is the difference between explicit and implicit differentiation?

How can the change of one variable depend on the change of another?

How can you find if a function has a maximum or minimum value?

How can you find the maximum or minimum of a function?

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	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: Derivative of functions Explicit and implicit form Related Rates Differentiation rules Rolle's Theorem Mean Value Theorem Increasing and decreasing functions First and second derivative tests Differentials	**Skills(Objectives):** Find the slope of the tangent line to a curve at a point Use the limit definition to find the derivative of a function 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 extrema of a function Determine intervals on which a function is concave up or concave down

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	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 sketch the graph of -Rational function -Radical function -Polynomial function -Trigonometric function Solve applied minimum and maximum problems Understand the concept of a tangent line approximation Compare the value of the differential, With the actual change in y, Δy Find the differential of a function using differentiation formulas

Interdisciplinary Connections:
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Stage 2: Assessment Evidence

Performance Task(s): A.CED. 2 http://tasks.illustrativemathematics.org/content-standards/HSA/CED/A/2/tasks/1215 N.Q.2 http://tasks.illustrativemathematics.org/content-standards/HSN/Q/A/2/tasks/83	**Other Evidence:** Written and Online Assignments Exit Cards Mid Chapter Quizzes End of Chapter Assessments End of Unit Common Assessments

Stage 3: Learning Plan

Learning Opportunities/Strategies: Turn and talk Student driven activities Think, Pair, Share strategy Small group collaboration Videos/apps when appropriate	**Resources:** Calculus, Graphical, Numerical, Algebraic, 4th Edition, Finney, Demana, Waits, Kennedy Delta math Pear Assessment Classkick Khan Academy Lesson Presentations and Videos 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

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	• 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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Unit Title: **Unit 3: 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 (

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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.C.8- Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function

F.IF.C.9-Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions)

F.BF.A.1-Write a function that describes a relationship between two quantities.

F.BF.B.3-Identify the effect on the graph of replacing $f(x)$ by $f(x)+k$, $kf(x)$, $f(kx)$, 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

F.BF.B.5-Use the inverse relationship between exponents and logarithms to solve problems involving logarithms and exponents

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

F.TF.A.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.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.

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

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

F.TF.B.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.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

Integration of Climate Change

- N.Q.A.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.
  Climate Change Example: Students may use units to guide the solution of multi-step problems about how variations in the flow of energy into and out of the Earth's systems result in climate change. Note: Changes in climate are limited to changes in surface temperatures, precipitation patterns, glacial ice volumes, sea levels, and biosphere distribution.
- N.Q.A.2 Define appropriate quantities for the purpose of descriptive modeling.
  Climate Change Example: Students may define appropriate quantities for a descriptive model of how variations in the flow of energy into and out of Earth's systems result in climate change. Note: changes in climate are limited to

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changes in surface temperatures, precipitation patterns, glacial ice volumes, sea levels, and biosphere distribution.

- N.Q.A.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. Climate Change Example: Students may, when reporting quantities related to how variations in the flow of energy into and out of the Earth's systems result in climate change, choose a level of accuracy appropriate to limitations on how quantities were measured.

Career Readiness, Life Literacies and Key Skills

Standard	Performance Expectations	Core Ideas
9.4.12.CI.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:

Understand the concept of area

Understand the definition of a Riemann sum

Understand the use of the mean value theorem for integrals

The area of a region between two curves

Volume using the disc method.

Essential/Guiding Question:

What is an antiderivative?

Why is it called "an" antiderivative instead of "the' antiderivative?

What is sigma notation?

What practical application would use the area of a region between two curves?

What is the definition of a solid of revolution?

How is the washer method an extension of the disc method?

Content:

Antiderivatives and Indefinite Integration
Riemann Sums and Definite Integrals
The Fundamental Theorem of Calculus
Integration by substitution and numerical integration
Trapezoid Rule
Area

Skills(Objectives):

Write the general solution of a differential equation

Use the indefinite integral notation for antiderivatives

Use basic integration rules to find Antiderivatives

Find a particular solution of a differential equation

Evaluate a definite integral Unit

Use sigma notation to write and evaluate a sum

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	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 Find the average value of a function over a closed interval Understand and use the Second fundamental theorem of calculus Find the area of a region between two curves Find the volume of a solid -of revolution using the disc method of revolution ,using the washer method , and with known cross section Find the area of a region between intersecting curves using integration

Interdisciplinary Connections:

Interdisciplinary connections are integrated in each unit with connections to the mathematical practices.

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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

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Stage 2: Assessment Evidence

Performance Task(s):
F. TF. 5
http://tasks.illustrativemathematics.org/content-standards/HSF/TF/B/5/tasks/595

F. BF. 5
http://tasks.illustrativemathematics.org/content-standards/HSF/BF/B/5/tasks/600

Other Evidence:
Written and Online Assignments
Exit Cards
Mid Chapter Quizzes
End of Chapter Assessments
End of Unit Common Assessments

Stage 3: Learning Plan

Learning Opportunities/Strategies:

Turn and talk

Student driven activities

Think, Pair, Share strategy

Small group collaboration

Videos/apps when appropriate

Resources:
Calculus, Graphical, Numerical, Algebraic, 4th Edition, Finney, Demana, Waits, Kennedy
Delta math
Pear Assessment
Classkick
Khan Academy
Lesson Presentations and Videos
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:
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- GLSEN Educator Resources
- Supporting LGBTQIA Youth Resource List
- Respect Ability: Fighting Stigmas, Advancing Opportunities
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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	Tutoring Tables Graphic organizers Differentiation of learning strategies: visual, auditory, kinetic and cooperative Technology connection Practice Assignments	Provide a highly structured, predictable learning environment Provide organizers/study guides Lessons designed to the style of learning that matches the student Cooperative Learning	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

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strategies: visual, auditory, kinetic and cooperative Enrichment and extension Technology connection Practice assignments Puzzle time activities Record and practice journal	Puzzle time activities Record and practice journal Differentiating the lesson activities Lesson tutorials Skills review handbook	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	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

Unit Title: Unit 4: 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. (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.BF.B.4-Find inverse functions.

F.BF.B.5-Use the inverse relationship between exponents and logarithms to solve problems involving logarithms and exponents

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

F.TF.A.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.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.

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

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

Calculus Honors

F.TF.B.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.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

Integration of Climate Change

- N.Q.A.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.
  Climate Change Example: Students may use units to guide the solution of multi-step problems about how variations in the flow of energy into and out of the Earth's systems result in climate change. Note: Changes in climate are limited to changes in surface temperatures, precipitation patterns, glacial ice volumes, sea levels, and biosphere distribution.
- N.Q.A.2 Define appropriate quantities for the purpose of descriptive modeling.
  Climate Change Example: Students may define appropriate quantities for a descriptive model of how variations in the flow of energy into and out of Earth's systems result in climate change. Note: changes in climate are limited to changes in surface temperatures, precipitation patterns, glacial ice volumes, sea levels, and biosphere distribution.
- N.Q.A.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
  Climate Change Example: Students may, when reporting quantities related to how variations in the flow of energy into and out of the Earth's systems result in climate change, choose a level of accuracy appropriate to limitations on how quantities were measured.

Career Readiness, Life Literacies and Key Skills

Standard	Performance Expectations	Core Ideas
9.4.12.CI.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 Question:
Develop and use properties of the natural logarithmic function Understand the definition of the number e Find derivative of functions involving the natural logarithmic function Use the log rule for integral to integrate a rational function Integrate trigonometric functions	What is e and how big is it? What is the difference between log and ln? What is an inverse function?

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Content:	**Skills(Objectives):**
The Natural Logarithmic Function Inverse functions Exponential functions Bases other than e and applications Differential equations Inverse trigonometric functions	Define exponential functions that have bases other than e Differentiate and integrate exponential functions that have bases other than e. Use exponential functions to model compound interest and exponential growth Use separation of variables to solve a simple differential equation 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 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:**
F. BF. 4 http://tasks.illustrativemathematics.org/content-standards/HSF/BF/B/4	Written and Online Assignments Exit Cards Mid Chapter Quizzes End of Chapter Assessments End of Unit Common Assessments

Stage 3: Learning Plan

Learning Opportunities/Strategies:	**Resources:**
Turn and talk Student driven activities Think, Pair, Share strategy Small group collaboration	Calculus, Graphical, Numerical, Algebraic, 4th Edition, Finney, Demana, Waits, Kennedy Delta math Pear Assessment Classkick Khan Academy Lesson Presentations and Videos Graphing Calculator

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Videos/apps when appropriate	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 Students	On Grade Level Students	Struggling Students	Special Needs/ELL
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	Tutoring Tables Graphic organizers Differentiation of learning strategies: visual, auditory, kinetic and cooperative Technology connection Practice Assignments Puzzle time activities Record and practice journal Differentiating the lesson activities Lesson tutorials Skills 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

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Pacing Guide

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