Algebra II Honors

Unit Title: **Unit 1: Equations, Relations and Functions**

Stage 1: Desired Results

Standards & Indicators:

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.

A.REI.D.11 – explain why the x-coordinates of the points where the graphs of two equations y = f(x) and y = g(x) intersect are the solutions of the equations f(x) = g(x). Find the solutions using technology, make tables of values and include cases where the functions are linear, polynomial, rational, absolute value, exponential and logarithmic functions.

F.IF.B.4 – for a function that models a relationship between two quantities, interpret key features of the graph and tables and sketch graphs 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.9 – compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions)

Integration of Climate Change

- 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.
- 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.
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

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		solutions are needed.
Central Idea/Enduring Understanding: Chapter 1 Equations are mathematical sentences that state a relationship between two or more mathematical expressions. Solutions for equations can be found by isolating the variable on one side of the equal sign using the Properties of Equality. A system of equations consists of two or more equations with the same variables. Systems of equations can be solved by graphing or algebraically by using the elimination method, the substitution method, or with the use of matrices. Systems of inequalities can be solved by graphing. Chapter 2 Linear relations and functions have straight line graphs. The rate of change of a linear function is known as the slope and can be found using any two points on the line. The equation of a line can be written whenever two points or a point and the slope of the line are known. A line of fit can be used to approximate the relation between domain and range values of a data set that exhibits a linear trend.	**Essential/Guiding Question:** At the end of the Unit, students should be able to answer the Essential Questions: Chapter 1- How are symbols useful in mathematics? How can you find the solution to a math problem? Chapter 2- How can mathematical ideas be represented?	
Content: 1.1 Solving linear equations 1.2 Solving linear inequalities 1.3 Rate of change and slope 1.6 Solving systems of equations 2.1 Functions and continuity 2.2 Linearity and symmetry 2.3 Extrema and end behavior 2.4 Sketching graphs of functions 2.5 Graphing special functions 2.6 Transformations of functions 2.7 Solving equations by graphing	**Skills(Objectives):** Translate verbal expressions into algebraic expressions and equations and vice versa Solve equations using the properties of equality Solve one step and multi step inequalities Find the rate of change Determine the slope of a line Solve systems of linear equations graphically and algebraically Determine whether functions are one to one and/or onto Determine whether functions are discrete or continuous Identify linear and nonlinear functions by examining equations or graphs Determine whether graphs of functions have line or point symmetry Identify end behavior of graphs Identify extrema of functions	

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	Use the key features of functions to sketch graphs of linear and non linear functions Graph and analyze piecewise defined functions Graph and analyze step and absolute value functions Identify the effects on graphs of functions by replacing f(x) with f(x) + k and f(x-h) for positive and negative values Identify the effects on graphs of functions by replacing f(x) with af(x), f(ax)-af(x) and f(-ax) Find x and y intercepts Solve equations by examining graphs of the related 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:
A.REI.D.11 Ideal Gas Law https://www.illustrativemathematics.org/content-standards/HSA/REI/D/11/tasks/1925 A.CED. 1 Paying the Rent http://tasks.illustrativemathematics.org/content-standards/HSA/CED/A/1/tasks/581 F.IF.C.7c Graphs of Power Functions https://www.illustrativemathematics.org/content-standards/HSF/IF/C/7/tasks/627 F.IF.C.7e Logistic Growth Model https://www.illustrativemathematics.org/content-standards/HSF/IF/B/4/tasks/804 F.IF.C.9 Throwing Baseballs https://www.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:
Lesson 1.1 solving linear equations	Glencoe Algebra 2 Textbook (Chapters 1 and 2)

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Translate verbal phrases, identify number properties, solve one step/multi step equations, use properties of equality Lesson 1.2 solving linear inequalities Solve one step/multi step inequalities, write an inequality, apply inequalities to real world situations Lesson 1.3 rate of change and slope Find slope using coordinates, find slope using a graph Interpret rate of change from real world problems Lesson 1.6 solving systems of equations Solve a system of equations by: using a table, graphing, substitution method or elimination method Lesson 2.1 functions and continuity Find domain and range, graph a relation, evaluate a function, identify discrete and continuous functions Lesson 2.2 linearity and symmetry Identify linear functions from equations and graphs, identify line and point symmetry Lesson 2.3 extrema and end behavior Describe the end behavior of linear and non-linear functions, estimate the zeros ad extrema of a graph, find end behavior and extrema Lesson 2.4 sketching graphs of functions Sketch a linear and non-linear graph, sketch a real world function Lesson 2.5 graphing special functions Graph and write a piece wise defined function, use a step function to model a real world problem, graph an absolute value function and identify the domain and range Lesson 2.6 transformations of functions Describe and graph a translation of a function, describe and graph a reflection, describe and graph dilations, identify transformations Lesson 2.7 solving equations by graphing Find x and y intercepts of graphs, find the zeros of a function, solve an equation by graphing	IXL Delta math Pear Assessment Kahoot Classkick NJSLA Digital Library 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: ● 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	

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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: Quadratic and Polynomial Functions

Stage 1: Desired Results

Standards & Indicators:

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.

A.REI.D.11 - Explain why the x-coordinates of the points where the graphs of two equations y = f(x) and y = g(x) intersect are the solutions of the equations f(x) = g(x). Find the solutions using technology, make tables of values and include cases where the functions are linear, polynomial, rational, absolute value, exponential and logarithmic functions.

A.REI.D.12 – Graph the solutions to a linear inequality in two variables as a half plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes.

A.APR.B.2
Know and apply the Remainder Theorem: For a polynomial p(x) and a number a, the remainder on division by x – a is p(a), so p(a) = 0 if and only if (x – a) is a factor of p(x).

A.APR.B.3

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Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial.

A.APR.D.6
Rewrite simple rational expressions in different forms; write a(x)/b(x) in the form q(x) + r(x)/b(x), where a(x), b(x), q(x), and r(x) are polynomials with the degree of r(x) less than the degree of b(x), using inspection, long division, or, for the more complicated examples, a computer algebra system.

A.SSE.A.2
Use the structure of an expression to identify ways to rewrite it

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.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 or graphically)

N.Q.A.2
Define appropriate quantities for descriptive modeling

Integration of Climate Change

- 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.
- 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).
- 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.

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.

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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.
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:**
Chapter 3 The graphs of quadratic functions are called parabolas. Each parabola has a vertex, axis of symmetry, and a y-intercept. Quadratic equations can be solved by graphing, factoring, completing the square, and by using the quadratic formula. Transformations to the parent graph can be more readily identified if the quadratic equation is written in vertex form. **Chapter 4** An expression made up of a sum of monomials that contain one variable is called a polynomial in one variable. Pascal's Triangle is an easy way to find the coefficients of the expansion of the powers of binomials. Tables of values can be used to explore graphs of polynomial functions. Factoring, synthetic substitution, and Descartes' Rule of Signs can be used to solve equations or find the zeros of polynomial functions.	At the end of the Unit, students should be able to answer the Essential Questions: Chapter 3 – Why do we use different methods to solve math problems? Chapter 4 – Why is math used to model real-world situations?
Content:	**Skills(Objectives):**
3.1 – Graphing quadratic functions 3.2 – Solving quadratic equations by graphing 3.3 – Complex numbers 3.4 – Solving quadratic equations by factoring 3.5 – Solving quadratic equations by completing the square 3.6 – The quadratic formula and the discriminant 3.7 – Quadratic inequalities 4.3 – Dividing polynomials 4.4 – Graphing polynomial functions 4.5 – Analyzing graphs of polynomial functions 4.6 – Solving polynomial equations 4.7 – Proving polynomial identities 4.8 – The remainder and factor theorem 4.9 – Roots and zeros	Graph quadratic functions Find and interpret the maximum and minimum values of a quadratic functions Solve quadratic functions by graphing Estimate solutions of quadratic equations by graphing Perform operations with pure imaginary and complex numbers Write quadratic equations in standard form Solve quadratic equations by factoring Solve quadratic equations by using the square root property Solve quadratic equations by completing the square

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	Solve quadratic equations by using the quadratic formula Use the discriminant to determine the number and type of roots of a quadratic equation Graph quadratic inequalities in two variables Solve quadratic inequalities in one variable Divide polynomials using long division and synthetic division Evaluate polynomial functions Identify general shapes of graphs of polynomial functions Graph polynomial functions and locate their zeros Find the relative maxima and minima of polynomial functions Factor polynomials Solve polynomial equations by factoring Prove polynomial identities Prove polynomial identities and use them to describe numerical relationships Evaluate functions by using synthetic substitution Determine whether a binomial is a factor of a polynomial by using synthetic substitution Determine the number and type of roots for a polynomial equation Find the zeros of a polynomial function

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:
A.APR.B.2 The Missing Coefficient	Written and Online Assignments Exit Cards

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https://www.illustrativemathematics.org/content-standards/HSA/APR/B/2/tasks/592 A.APR.B.3 Graphing from Factors III https://www.illustrativemathematics.org/content-standards/HSA/APR/B/3/tasks/1657 A.APR.D.6 Combined Fuel Efficiency https://www.illustrativemathematics.org/content-standards/HSA/APR/D/6/tasks/825 A.REI.D.12- Solution Sets http://tasks.illustrativemathematics.org/content-standards/HSA/REI/D/12/tasks/1205	Mid Chapter Quizzes End of Chapter Assessments End of Unit Common Assessments
Stage 3: Learning Plan	
Learning Opportunities/Strategies: Lesson 3.1 – graphing quadratic functions Graph a quadratic function by using a table, find the y-intercept, the axis of symmetry and x coordinate of the vertex, identify maximum and minimum values, apply quadratic equations to real world problems Lesson 3.2 – solving quadratic equations by graphing solve a quadratic equation and identify the number of real solutions (0,1,2), estimate the roots of a quadratic, solve a quadratic using a table and calculator Lesson 3.3 – complex numbers find the square root of negative numbers, find the products of imaginary numbers, solve in equation with imaginary solutions, add, subtract, multiply and divide complex numbers Lesson 3.4 – solving quadratic equations by factoring translate sentences into equations, factor the GCF, solve equations using perfect squares and differences of squares, factor trinomials, solve equations by factoring Lesson 3.5 – solving quadratic equations by completing the square solve an equation with rational and irrational roots, complete the square, solve an equation by completing the square, solve equations with imaginary solutions	**Resources:** Glencoe Algebra 2 Textbook (Chapters 3 and 4) IXL Delta math Pear Assessment Kahoot Classkick NJSLA Digital Library 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: ● 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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Lesson 3.6 – the quadratic formula and the discriminant solve a quadratic equation using the quadratic formula that contains: two rational roots, one rational root, irrational roots or complex roots, describe roots Lesson 3.7 – quadratic inequalities Graph a quadratic inequality, solve a quadratic inequality graphically and algebraically, solve a real world problem using quadratic inequalities Lesson 4.3 – dividing polynomials Divide a polynomial by a monomial, use long division to divide a trinomial by a binomial, use synthetic division to divide polynomials Lesson 4.4 – graphing polynomial functions identify the degree and leading coefficient of polynomials, evaluate a polynomial function, find function values of variables Lesson 4.5 – analyzing graphs of polynomial functions Locate the zeros of a function, find the maximum and minimum points of a function, graph a polynomial model Lesson 4.6 – solving polynomial equations factor using the sum and differences of cubes, factor by grouping, solve polynomial functions by factoring, write expressions and solve equations in quadratic form Lesson 4.7 – proving polynomial identities prove polynomial identities by writing proofs, use technology to prove that polynomials are identities Lesson 4.8 – the remainder and factor theorem use synthetic substitution to evaluate functions, find function values, use the factor theorem Lesson 4.9 – roots and zeros determine the number and type of roots of a function, find the number of positive, negative and imaginary zeros, use synthetic substitution to find zeros, use zeros to write a polynomial function	
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	

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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 3: Radical, Exponential and Logarithmic Functions**

Stage 1: Desired Results

Standards & Indicators:

A.REI.A.2
Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.

A.REI.D.11
explain why the x-coordinates of the points where the graphs of two equations y = f(x) and y = g(x) intersect are the solutions of the equations f(x) = g(x). Find the solutions using technology, make tables of values and include cases where the functions are linear, polynomial, rational, absolute value, exponential and logarithmic functions.

A.SSE.A.2
Use the structure of an expression to identify ways to rewrite it

A.SSE.B.4
Derive and/or explain the formula for the sum of a finite geometric series (when the common ratio is not 1), and use the formula to solve problems. For example, calculate mortgage payments

F.BF.A.1

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Write a function that describes a relationship between two quantities

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.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 tables, or by verbal descriptions)

F.LE.A.4
Understand the inverse relationship between exponents and logarithms. For exponential models, express as a logarithm the solution to abct = d where a, c, and d are numbers and the base b is 2, 10, or e; evaluate the logarithm using technology.

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:

Chapter 5
The inverse of a function can be found by exchanging the domain and range of the function. Functions with a variable under a radical symbol are called radical functions. Two types of radical functions are square root functions and cube root functions. When solving radical equations, first isolate the radical, then raise each side to the power equal to the index of the radical, and finally, solve the resulting equation.

Essential/Guiding Question:

At the end of the Unit, students should be able to answer the Essential Questions:

Chapter 5 - How can you choose a model to represent a set of data?
Chapter 6 - How can you make good decisions? What factors can affect good decision making?

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Chapter 6 An exponential equation is in the form y = bx, where b > 0 and b ≠ 1. The equation represents exponential growth when b > 1 and exponential decay when 0 < b < 1. The inverse of an exponential function is the logarithmic function.	
Content: 5.1 – Operations with functions 5.2 – Composition of functions 5.3 – Inverse functions and relations 5.4 – Graphing square root functions 5.5 – Graphing cube root functions 5.6 – Solving radical equations 6.1 – Graphing exponential functions 6.2 – Solving exponential functions and inequalities 6.3 – Geometric sequences and series 6.4 – Logarithms and logarithmic functions 6.6 – Properties of logarithms 6.7 – Common logarithms 6.8 – Natural logarithms 6.9 – Solving logarithmic equations and inequalities 6.10 – Using logarithms to solve exponential problems	**Skills(Objectives):** Perform arithmetic operations with functions Apply arithmetic operations with functions Perform compositions of functions Apply compositions of functions Find the inverse of a function or relation Determine whether two functions or relations are inverses Graph and analyze square root functions Graph and analyze cube root functions Solve equations containing radicals Solve inequalities containing radicals Graph exponential growth and decay functions Solve exponential equations and inequalities Use geometric sequences Find sums of geometric series Evaluate logarithmic expressions Graph logarithmic functions Simplify and evaluate expressions using the properties of logarithms Solve logarithmic equations using the properties of logarithms Solve exponential equations and inequalities using common logarithms Evaluate logarithmic expressions using the change of base formula Evaluate expressions involving the natural base and natural logarithm

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	Solve exponential equations and inequalities using natural logarithms Solve logarithmic equations and inequalities Use logarithms to solve problems involving exponential growth and decay Use logarithms to solve problems involving logistic growth

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):
A.SSE.A.2
A Cubic Identity
https://www.illustrativemathematics.org/content-standards/HSA/SSE/A/2/tasks/919

A.SSE.B.4
Course of Antibiotics
https://www.illustrativemathematics.org/content-standards/HSA/SSE/B/4/tasks/805

F.BF.A.1b
A Sum of Functions
https://www.illustrativemathematics.org/content-standards/HSF/BF/A/1/tasks/230

F.BF.B.4a
Temperatures in degrees Fahrenheit and Celsius
https://www.illustrativemathematics.org/content-standards/HSF/BF/B/4/tasks/501

F.LE.A.4 Newton's Law of Cooling
http://tasks.illustrativemathematics.org/content-standards/HSF/LE/A/4/tasks/382

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:
Lesson 5.1 – operations with functions
add and subtract functions, multiply and divide functions, create a function,

Lesson 5.2 – composition of functions

Resources:
Glencoe Algebra 2 Textbook (Chapters 5 and 6)
IXL
Delta math
Pear Assessment
Kahoot

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evaluate and perform compositions of functions, apply compositions of functions to real world problems Lesson 5.3 – inverse functions and relations find and graph an inverse, find inverses with restricted domains, verify that two functions are inverses Lesson 5.4 – graphing square root functions identify domain and range, graph square root functions, use graphs to analyze square root functions, find the inverse of power functions Lesson 5.5 – graphing cube root functions identify attributes of cube root functions, graph cube root functions, find the inverse of cubic functions Lesson 5.6 – solving radical equations Solve radical equations, solve a cube root equation, solve a radical equation Lesson 6.1 – graphing exponential functions graph exponential growth functions, graph exponential decay functions, graph transformations Lesson 6.2 – solving exponential functions and inequalities Solve exponential equations, write an exponential function, apply functions to compound interest, solve exponential inequalities Lesson 6.3 – geometric sequences and series find the nth term, write an equation for the nth term, find geometric means, find the sum of a geometric series, find the sum in sigma notation, find the first term of a series Lesson 6.4 – logarithms and logarithmic functions logarithmic to exponential form, exponential to logarithmic form, evaluate logarithmic expressions, graph logarithmic functions Lesson 6.6 – properties of logarithms Use the product property, quotient property, power property of logarithms, solve equations using properties of logarithms Lesson 6.7 – common logarithms find common logarithms, solve logarithmic equations, solve exponential equations using	Classkick NJSLA Digital Library 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: ● 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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logarithms , solve exponential inequalities using logarithms, change of base formula Lesson 6.8 – natural logarithms Write equivalent expressions, simplify expressions with e and the Natural log, solve base e equations and inequalities, solve natural log equations and inequalities Lesson 6.9 – solving logarithmic equations and inequalities Solve a logarithmic equation, solve a logarithmic inequality, solve inequalities with logarithms on each side Lesson 6.10 – using logarithms to solve exponential problems Exponential decay problems, carbon dating, continuous exponential growth	

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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Unit Title: **Unit 4: Rational Functions and Probability**

Stage 1: Desired Results

Standards & Indicators:

A.REI.A.2
Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.

A.REI.D.11
explain why the x-coordinates of the points where the graphs of two equations y = f(x) and y = g(x) intersect are the solutions of the equations f(x) = g(x). Find the solutions using technology, make tables of values and include cases where the functions are linear, polynomial, rational, absolute value, exponential and logarithmic functions.

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

S.IC.B.3
Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.

S.IC.B.4
Use data from a sample survey to estimate a population mean or proportion; develop a margin of error through the use of simulation models for random sampling.

S.IC.B.5
Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant.

S.IC.B.6
Evaluate reports based on data.

Integration of Climate Change

- S.ID.B.6 Represent data on two quantitative variables on a scatter plot and describe how the variables are related.
  Climate Change Example: Students may represent geoscience data on two quantitative variables on a scatter plot and describe how the variables are related in order to analyze the data and the results from global climate models.
- S.ID.B.6a Fit a function to the data (including with the use of technology); use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear and exponential models.
  Climate Change Example: Students may use linear or exponential functions fitted to geoscience data to solve problems and analyze the results from global climate models to make an evidence-based forecast of the current rate of global climate change.

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.

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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.
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:**
Chapter 7 Rational expressions are ratios of two polynomial expressions. Operations with rational expressions are similar to operations with fractions. The graphs of some rational functions have breaks in continuity and may have vertical and horizontal asymptotes. Rational equations can be solved as polynomial equations once the fractions are eliminated by multiplying by the LCD Chapter 8 A statistic is a measure that describes a characteristic of a sample. The shape of a distribution of data can be symmetric, positively skewed, or negatively skewed. The mean and standard deviation or five-number summary can be used to describe or compare the distribution of sets of data. A probability distribution is a function that maps the sample space to the outcomes in the sample space. The normal distribution is a continuous, symmetric, bell-shaped distribution of a random variable.	At the end of the Unit, students should be able to answer the Essential Questions: Chapter 7 – Why are graphs useful? Chapter 8 - How can you effectively evaluate information? How can you use information to make decisions?
Content:	**Skills(Objectives):**
7.3 – Graphing reciprocal functions 7.4 – Graphing rational functions 7.5 – Variation functions 7.6 – Solving rational equations and inequalities 8.1 – Random sampling 8.2 – Using statistical experiments 8.3 – Population parameters 8.5 – Evaluating published data 8.6 – Normal distributions	Determine properties of reciprocal functions Graph transformations of reciprocal functions Graph rational functions with vertical and horizontal asymptotes Graph rational functions with oblique asymptotes and point discontinuity Recognize and solve direct and joint variation problems Recognize and solve inverse and combined variation problems Solve rational equations and inequalities

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	Distinguish among sample surveys, experiments and observational studies Make inferences about population parameters based on random samples of the population Collect and analyze data by conducting simulations of real life situations Use data to compare theoretical and experimental probabilities Use data from sample surveys to estimate population means or proportions Develop margins of error by using simulation models Evaluate reports based on data Identify and explain misleading uses of data Use the empirical rule to analyze normally distributed variables Apply the standard normal distribution and z-values

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:
S.IC.A.1 School Advisory Panel https://www.illustrativemathematics.org/content-standards/HSS/IC/A/1/tasks/186 S.IC.A.2 Sarah, the chimpanzee https://www.illustrativemathematics.org/content-standards/HSS/IC/A/2/tasks/1099 S.IC.B.3 Strict Parents https://www.illustrativemathematics.org/content-standards/HSS/IC/B/3/tasks/122 F.IF.B.4 Influenza Epidemic	Written and Online Assignments Exit Cards Mid Chapter Quizzes End of Chapter Assessments End of Unit Common Assessments

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http://tasks.illustrativemathematics.org/content-standards/HSF/IF/B/4/tasks/637	

Stage 3: Learning Plan

Learning Opportunities/Strategies:

Lesson 7.3 – graphing reciprocal functions
determine limitations on a domain, determine properties of reciprocal functions, graph transformations, write equations to represent real world problems

Lesson 7.4 – graphing rational functions
graph with no horizontal asymptote, use graphs of rational functions, determine oblique asymptotes, graph with point discontinuity

Lesson 7.5 – variation functions
Find direct variation and joint variation, write and solve an inverse and combined variation

Lesson 7.6 – solving rational equations and inequalities
solve a rational equation, solve a mixture problem, solve a distance problem, solve a rational inequality

Lesson 8.1 – random sampling
classify study types, make an inference about population

Lesson 8.2 – using statistical experiments
design a simulation by using random numbers, conduct and evaluate a simulation, conduct and summarize data from a simulation

Lesson 8.3 – population parameters
use data to estimate population mean, calculate margin of error, use margin of error to find sample size

Lesson 8.5 – evaluating published data
evaluate a report, identify misleading uses of data

Lesson 8.6 – normal distributions
use the empirical rule to analyze data and distributions, use z-values to locate position, find probabilities

Resources:

Glencoe Algebra 2 Textbook (Chapters 7 and 8)
IXL
Delta math
Pear Assessment
Kahoot
Classkick
NJSLA Digital Library
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:

- Learning for Justice
- GLSEN Educator Resources
- Supporting LGBTQIA Youth Resource List
- Respect Ability: Fighting Stigmas, Advancing Opportunities
- NJDOE Diversity, Equity & Inclusion Educational Resources
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Pacing Guide

Algebra II Honors	Glencoe Algebra II	Standards
UNIT 1 Equations, Relations and Functions (18 Days)	**CHAPTERS** 1: (11 Days) 2: (7 Days)	A.REI.D.11 F.IF.B.4 F.IF.B.6 A.CED.A1 F.IF.C.7 F.IF.C.9
UNIT 2 Quadratic and Polynomial Functions (22 Days)	**CHAPTERS** 3: (10 Days) 4: (12 Days)	A.APR.B.2-3 A.REI.D.11-12 A.SSE.A.2 F.IF.B.4 F.IF.B.6 A.APR.D.6 A.CED.A.1 F.IF.C.8 -9 N.Q.A.2
END OF MP		
UNIT 3 Radical, Exponential and Logarithmic Functions (20 Days)	**CHAPTERS** 5: (6 Days) 6: (14 Days)	A.REI.2,11 A.SSE.A.2 A.SSE.B.4 F.BF.A.1 F.IF.B.4 F.IF.C.7 -9 F.LE.A.4 N.RN.2
UNIT 4 Rational Functions & Probability (18 Days)	**CHAPTERS** 7: (9 Days) 8: (9 Days)	A.REI.2 A.REI.D.11 F.IF.B.4 S.IC.B.3 -6
END OF MP		