PITTSGROVE TOWNSHIP SCHOOL DISTRICT

Pittsgrove Township
School District
P.R.I.D.E. Patience Respect Integrity Diligence Empathy

Course Name: Algebra II CP	**Grade Level(s): 10, 11, 12**
Department: Math	**Credits: 5**
BOE Adoption Date: July 2013	**Revision Date(s): August 2019**

Course Description

This course provides continued work with variables and polynomials, solving exponential, quadratic and rational equations and inequalities, graphing, and introduces the student to radicals, complex numbers, and logarithms. Emphasis is on problem solving. Class work will include presentation of course material by the instructor, accompanied by appropriate problem solving assignments.

The following practices rest on important "processes and proficiencies" with longstanding importance in mathematics education.

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.

Mission Statement

The Pittsgrove Township School District believes in growing all learners to thrive. *The district offers an intellectually rigorous, dynamic curriculum aligned to state and national standards coupled with research-based practices in classrooms. The Pittsgrove Township School District strives to highlight critical thinking, problem-solving, intercultural literacy, digital literacy, collaboration, innovation, and a growth mindset as part of the instructional core of learning. The district provides high quality resources to provide young people the knowledge they need to approach the future as leaders and learners.*

Curriculum & Instruction Goals

1. To ensure students are college and career ready upon graduation
2. To vertically and horizontally align curriculum PreK-12 to ensure successful transition of students at each grade level
3. To identify individual student strengths and weaknesses utilizing various assessment measures (formative, summative, alternative, etc.) so as to differentiate instruction while meeting the rigor of the applicable content standards
4. To improve student achievement as assessed through multiple measures including, but not limited to, state testing, local assessments, and ongoing progress monitoring

How to Read this Document

This curricular document contains both a *pacing guide* and *curriculum units*. The pacing guide serves to communicate an estimated timeframe as to *when* critical knowledge and skills will be taught throughout the year. The pacing, however, may differ slightly depending upon the unique needs of each learner. The *curriculum units* contain more detailed information as to the content, goals, objectives, instructional strategies, resources, and assessments.

NJ Administrative Code and Statutes Key
^=Amistad Law O=Diversity & Inclusion Law <>=Holocaust +=LGBT and Disabilities Law *=AAPI (Asian American and Pacific Islanders) $=Financial Literacy Use this key to understand where the NJ mandates are being implemented in the K-12 curriculum units.

Pacing Guide

Course Title: CP Algebra 2

Prerequisite(s): Algebra 1

Unit Title	Duration/ Month(s)	Related Standards	Learning Goals	Critical Knowledge and Skills
Unit 1: Quadratic Functions	**September/February** **Length:** 3 weeks	**Subject Area: Mathematics** NJSLS.F.IF.7A NJSLS.A.SSE.3A NJSLS.A.REI.4B NJSLS.N.CN.2 NJSLS.A.REI.4A **Mathematical Practices:** MP1 MP2 MP3 MP4 MP5 MP6 MP7 MP8	The students will be able to graph quadratic functions written in standard form, vertex form, or intercept form. The students will be able to solve a quadratic equation using a variety of methods and will be able to recognize when the solutions are complex. (The methods include factoring, finding square roots, completing the square, and using the quadratic formula). The students will be able to perform arithmetic operations with complex numbers.	**Learning objectives for this Unit:** ● To graph quadratic functions in standard form, vertex form, and intercept form ● To factor binomials and trinomials, including special quadratic expressions ● To solve quadratic equations by factoring and by finding square roots ● To add, subtract, and multiply complex numbers ● To solve equations and rewrite functions by completing the square ● To solve equations using the quadratic formula ● To determine the type of solutions by using the discriminant

PTSD Office of Curriculum and Instruction

Unit 2: Polynomials and Polynomial Functions	**October/March** **Length:** 3 weeks	**Subject Area:** **Mathematics** NJSLS.N.RN.1 NJSLS.F.IF.7C NJSLS.A.APR.1 NJSLS.A.SSE.2 NJSLS.A.APR.2 NJSLS.N.CN.9 **Mathematical Practices** MP1 MP2 MP3 MP4 MP5 MP6 MP7 MP8	The students will apply properties of exponents as they simplify expressions involving powers. The students will perform arithmetic operations on polynomials and complex numbers. The students will understand the relationship between zeros and factors of polynomials by using the remainder theorem and the fundamental theorem of algebra. The students will be able to identify the zeros of polynomials and use the zeros to construct a rough graph of the function it represents.	**Learning objectives for this Unit:** ● To use properties of exponents ● To classify polynomials ● To write a polynomial function from its zeros ● To divide polynomials using long and synthetic division ● To solve polynomial equations by graphing and factoring ● To solve polynomial equations using the Rational Root Theorem ● To use the Fundamental Theorem of Algebra to find all of the zeros of a polynomial function
Unit 3: Rational Exponents and Radical Functions	**November/April** **Length:** 3 weeks	**Subject Area:** **Mathematics** NJSLS.N.RN.1 NJSLS.N.RN.2 NJSLS.F.BF.1 NJSLS.F.BF.4 NJSLS.F.IF.7B NJSLS.A.REI.2 **Mathematical Practices** MP1 MP6	The students will be able to extend the properties of exponents to rational exponents. The students will be able to combine standard function types using arithmetic operations, including composition. The students will know how to determine whether a given function has an inverse that is also a	**Learning objectives for this Unit:** ● To simplify and evaluate nth roots ● To apply properties of rational exponents ● To perform function operations and composition ● To determine if a function has an inverse function ● To graph square roots and cube roots ● To solve radical equations

			function. The students will be able to graph square roots and cube root functions. The students will be able to solve radical and rational equations in one variable, and give examples showing how extraneous solutions may arise.	
		MP7		
Unit 4: Exponential and Logarithmic Functions	**December/May** **Length:** 2-2.5 weeks	**Subject Area:** **Mathematics** NJSLS.A.SSE.B.3 NJSLS.F.LE.A.4 NJSLS.F.IF.C.8 NJSLS.F.BF.B.4 NJSLS.F.BF.B.5 NJSLS.F.LE.B.5 **Mathematical Practices** MP4 MP5 MP6 MP7	The students will be able to use the properties of exponents to transform expressions for exponential functions. The students will understand the inverse relationship between exponents and logarithms and use this relationship to solve problems.	**Learning objectives for this Unit:** ● To graph exponential functions ● To solve exponential equations ● To evaluate logarithmic expressions ● To simplify and evaluate expressions using the properties of logarithms ● To solve logarithmic equations using the properties ● To solve exponential equations using common logarithms ● To evaluate logarithmic expressions using the change of base formula
Unit 5: Rational	**January/June**	**Subject Area:**	The students will write and use	**Learning objectives for this Unit:**

Functions	Length: 2-3 weeks	Mathematics NJSLS.A.APR.D.7 NJSLS.F.IF.7D NJSLS.F.IF.9 NJSLS.A.REI.2 Mathematical Practices: MP4 MP5 MP6 MP7	models for inverse variation, direct variation, and joint variation. The students will graph rational functions, multiply, divide, add, and subtract rational expressions, and simplify complex fractions. The students will solve rational expressions.	● Model inverse, direct, and joint variation ● Graph rational functions ● Multiply, Divide, Add, and Subtract rational expressions ● Solve rational equations

Instructional Unit Map			
Course Title: Algebra II			
Unit Title	**Quadratic Functions & Factoring**	**Start Date:**	September/February
		Length of Unit:	3 weeks
Content Standards *What do we want them to know, understand, & do?*	NJSLS.F.IF.7A - Graph linear and quadratic functions and show intercepts, maxima, and minima. NJSLS.A.SSE.3A - Factor a quadratic expression to reveal the zeros of the function it defines. NJSLS.A.REI.4B - Solve quadratic equations by inspection (e.g., for $x2 = 49$), taking square roots, completing the square, the quadratic formula and	**Learning Goals**	The students will be able to graph quadratic functions written in standard form, vertex form, or intercept form. The students will be able to solve a quadratic equation using a variety of methods and will be able to recognize when the solutions are complex. (The methods include factoring, finding square roots, completing the square, and using the quadratic formula). The students will be able to perform arithmetic operations with complex numbers.

	factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as a ± bi for real numbers a and b. NJSLS.N.CN.2 - Use the relation i^2 = –1 and the commutative, associative, and distributive properties to add, subtract, and multiply complex numbers. NJSLS.A.REI.4A - Use the method of completing the square to transform any quadratic equation in x into an equation of the form (x – p) 2 = q that has the same solutions. Derive the quadratic formula from this form.		
Essential Questions	● *What are the different methods which can be used to solve a quadratic equation?* ● *How are quadratic functions used to model, analyze, and interpret mathematical relationships?*		

Assessments *How will we know they have gained the knowledge & skills?*	**Formative**	**Summative**	**Alternative**
	● Warm-ups/exit tickets ● Graded homework and	● Quizzes	● Chapter 1 Quadratic

	classwork assignments ● Verbally check for understanding ● Class Participation ● Teacher observation	● Chapter Test ● Real-Life Applications	Functions Menu Project ● Alternative Chapter 1 Assessment
Unit Pre-Assessment(s) *What do they already know?*	● Warm-Up Chapter 1 Pre-Assessment (Algebra II Textbook) ● Teacher-generated warm-up questions		
Instructional Strategies/Student Activities	● Direct Instruction ● Note-taking sheet ● Guided Practice ● Cooperative Learning (group work) ● Modeling ● Learning Stations ● Differential Learning Activities (Ex: Scavenger Hunts, Color-by-Numbers, Mazes, Etc.)		
Instructional/Assessment Scaffolds *(Modifications /Accommodations) – planned for prior to instruction*	**English Language Learners**	**Special Education Learners**	**Struggling Learners**	**Advanced Learners**
	● Oral Directions (repeat if necessary) ● Strategies for Reading Mathematics ● Highlight keywords in directions or word problems	● Oral Directions (repeat if necessary) ● Preferred Seating ● Calculator ● Complete set of notes (if needed)	● Manipulatives ● Group work ● Calculators ● Provide examples ● Guided practice worksheets with work shown ● Test corrections (when needed) ● Small group work with	● Tiered classwork assignments ● Flexible grouping ● Independent study (with teacher guidance when needed)

	● Preferred Seating ● Calculator ● Complete set of notes (if needed) ● Manipulatives ● Test retakes	● Key terms, formulas, equations highlighted ● Manipulatives ● Test retakes ● Extra time ● Modified testing (if needed)	the teacher ● Provide study guides

Differentiated Instructional Methods: *(Multiple means for students to access content and multiple modes for student to express understanding)*	**Access** (Resources and/or Process)	**Expression** (Products and/or Performance)
	● Note-taking sheet ● Standard-aligned Learning Stations/Activities ● Targeted Lessons based on progress	● Challenge/application examples

Vocabulary *Highlight key vocabulary (both Tier II and Tier III words)*	Tier II: graph, write, solve, operations, minimum, maximum Tier III: parabola, vertex form, intercept form, standard form of a quadratic function, quadratic equation, root of an equation, zero of a function, square root, complex number, imaginary number, completing the square, quadratic formula, discriminant
Integration of Technology SAMR	S: Google Classroom Assignments A and M: Desmos.com S, A, and M: Khan Academy S: Graphing Calculator

Interdisciplinary Connections NJ Student Learning Standards	**Technology:** ● **NJSLS.8.2.12.C.5** Create scaled engineering drawings of products both manually and digitally with materials and measurements labeled. **ELA:** ● **NJSLS.RL.11-12.4** Determine the meaning of words and phrases as they are used in the text, including figurative and connotative meanings. ● **NJSLSA.R1** Read closely to determine what the text says explicitly and to make logical inferences and relevant connections from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text. **Career Ready Practices:** ● **CRP1 -** Act as a responsible and contributing citizen and employee. ● **CRP2** - Apply appropriate academic and technical skills. ● **CRP6** - Demonstrate creativity and innovation.

21st Century Themes/Skills P21 Framework	Themes	Skills
	● Global Awareness	● Critical Thinking and Problem Solving ● Life and Career Skills

Resources/Materials	**Resources:** ● Larson Algebra 2 Textbook (Holt McDougal Common Core Edition) ● Google Classroom ● Teacher-generated worksheet (practice) ● Teacher-generated notes ● Teacherspayteachers.com (Scavenger Hunt, Maze, Matching Activity, Color-by-Number) ● Khan Academy ● Desmos.com

	Materials:
	- Chromebooks - Manipulatives

Instructional Unit Map

Course Title: Algebra II A

Unit Title	**Polynomial Functions**		**Start Date:**	October/March
			Length of Unit:	3 weeks

Content Standards *What do we want them to know, understand, & do?*	NJSLS.N.RN.1 - Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in	**Learning Goals**	The students will be able to graph quadratic functions written in standard form, vertex form, or intercept form. The students will be able to solve a quadratic equation using a variety of methods and will be able to recognize when the solutions are complex. (The methods include factoring, finding square roots, completing the square, and using the quadratic formula).

	terms of rational exponents. *For example, we define $5^{1/3}$ to be the cube root of 5 because we want $(5^{1/3})^3 = 5^{(1/3)^3}$ to hold, so $(5^{1/3})^3$ must equal 5.* NJSLS.F.IF.7C - Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior. NJSLS.A.APR.1 - Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials. NJSLS.A.SSE.2 - Use the structure of an expression to identify ways to rewrite it. *For example, see $x^4 - y^4$ as $(x^2)^2 - (y^2)^2$, thus recognizing it as a*		The students will be able to perform arithmetic operations with complex numbers.

	difference of squares that can be factored as ($x^2 - y^2$)($x^2 + y^2$). NJSLS.A.APR.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 $p(x)$. NJSLS.N.CN.9 - (+) Know the Fundamental Theorem of Algebra; show that it is true for quadratic polynomials.	

Essential Questions	*Explain how to factor a higher order polynomial. Are all polynomials factorable?* *What does the degree (and leading coefficient) of a polynomial tell you about its related polynomial function?* *For a polynomial function, how are factors, roots, and x-intercepts related?* *What are imaginary and complex numbers used for in real-world applications?*

Assessments *How will we know they have gained the knowledge & skills?*	**Formative**	**Summative**	**Alternative**
	- Warm-ups/exit tickets - Graded homework and	Quizzes	Alternative Chapter 2

	classwork assignments ● Verbally check for understanding ● Class Participation ● Teacher observation	● Chapter Test	Math Journal & Multi-Step Problem
Unit Pre-Assessment(s) *What do they already know?*	● Warm-Up Chapter 2 Pre-Assessment (Algebra II Textbook) ● Teacher-generated warm-up questions		
Instructional Strategies/Student Activities	● Introduction to Graphing Polynomial Functions Activity ● Direct Instruction ● Note-taking sheet ● Guided Practice ● Modeling ● Cooperative Learning (group work) ● Differential Learning Activities (Ex: Scavenger Hunts, Stations, etc.)		

Instructional/Assessment Scaffolds *(Modifications /Accommodations) – planned for prior to instruction*	**English Language Learners**	**Special Education Learners**	**Struggling Learners**	**Advanced Learners**
	● Oral Directions (repeat if necessary) ● Strategies for Reading Mathematics ● Graphic organizers for key objectives in this unit ● One-on-one	● Oral Directions (repeat if necessary) ● Preferred Seating ● Calculator ● Complete set of notes (if needed)	● Concrete examples and visuals of different types of graphs ● Group work ● Calculators ● Guided practice worksheets with work shown ● Test corrections (when needed)	● Flexible grouping ● Independent study to discover real-world examples (with teacher guidance when needed)

	- re-teaching (if needed) - Calculator - Complete set of notes (if needed) - Test retakes	- Concrete examples and visuals of different types of graphs - Manipulatives - Test retakes - Extra time - Modified testing (if needed)	- Small group work with the teacher - Provide study guides	

Differentiated Instructional Methods: *(Multiple means for students to access content and multiple modes for student to express understanding)*	**Access** (Resources and/or Process)	**Expression** (Products and/or Performance)
	- Note-taking sheet - Concrete examples of graphs - Standard-aligned Learning Stations/Activities - Targeted Lessons based on progress	- Real-world applications

Vocabulary *Highlight key vocabulary (both Tier II and Tier III words)*	Tier II: graph, write, difference, sum, product, scientific notation, factoring, constant Tier III: polynomial, polynomial function, synthetic substitution, end behavior, like terms, factoring by grouping, quadratic form, polynomial long division, synthetic division, zero of a function, constant term, leading coefficient, irrational conjugates, complex conjugates

Integration of Technology SAMR	S: Google Classroom Assignments A and M: Desmos.com S, A, and M: Khan Academy

Interdisciplinary Connections NJ Student Learning Standards	**Career Ready Practices:** ● **CRP1 -** Act as a responsible and contributing citizen and employee. ● **CRP2 -** Apply appropriate academic and technical skills. ● **CRP11** - Use technology to enhance productivity. **ELA:** ● **NJSLSA.R1** Read closely to determine what the text says explicitly and to make logical inferences and relevant connections from it. ● **NJSLSA.R4** Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone. ● **NJSLS.RL.11-12.4** Determine the meaning of words and phrases as they are used in the text, including figurative and connotative meanings.	
21st Century Themes/Skills P21 Framework	Themes	Skills
	● Civic Literacy (explore polynomial graphs and how they relate to rollercoaster designs)	● Critical Thinking and Problem Solving ● Life and Career Skills ● Communication & Collaboration
Resources/Materials	**Resources:** ● Larson Algebra 2 Textbook (Holt McDougal Common Core Edition) ● Google Classroom ● Teacher-generated worksheets and activities (practice, stations, etc.) ● Teacher-generated notes ● Teacherspayteachers.com (Scavenger Hunt) ● Khan Academy ● Desmos.com **Materials:** ● Chromebooks	

| | ● Manipulatives |
| | ● Graphing Calculators |

Instructional Unit Map

Course Title: Algebra II A

| Unit Title | **Rational Exponents and Radical Functions** | Start Date: | November/April |
| | | Length of Unit: | 3 weeks |

| **Content Standards**
What do we want them to know, understand, & do? | NJSLS.N.RN.1 - Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents. *For example, we define $5^{1/3}$ to be the cube root of 5 because we want $(5^{1/3})^3 = 5^{(1/3)3}$ to hold, so $(5^{1/3})^3$ must equal 5.*

NJSLS.N.RN.2 - Rewrite expressions involving radicals and rational exponents using the properties of exponents.

NJSLS.F.BF.1 - . Write a | **Learning Goals** | The students will be able to extend the properties of exponents to rational exponents.

The students will be able to combine standard function types using arithmetic operations, including composition.

The students will know how to determine whether a given function has an inverse that is also a function.

The students will be able to graph square roots and cube root functions.

The students will be able to solve radical and rational equations in one variable, and give examples showing how extraneous solutions may arise. |

	function that describes a relationship between two quantities.* NJSLS.F.BF.4 - Find inverse functions. NJSLS.F.IF.7B - Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions. NJSLS.A.REI.2 - Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.		

Essential Questions	● *What is the relationship between nth roots and rational exponents?* ● *How are the properties of rational exponents related to the properties of integer exponents?* ● *How are a function and its inverse function related? How can you tell if two functions are inverses of each other?* ● *How can knowing that the roots and exponents are inverses help in solving radical equations?*		

Assessments *How will we know they have gained the knowledge & skills?*	**Formative**	**Summative**	**Alternative**
	● Warm-ups/exit tickets ● Graded homework and classwork assignments	● Quizzes ● Chapter Test ● Extended Response	● Alternative Chapter 3 Math Journal & Multi-Step Problem

	● Group work ● Teacher observation		
Unit Pre-Assessment(s) *What do they already know?*	● Warm-Up Chapter 3 Pre-Assessment (Algebra II Textbook) ● Key prerequisite vocabulary assessment		
Instructional Strategies/Student Activities	● Direct Instruction ● Note-taking sheet ● Guided Practice ● Cooperative Learning (group work) ● Learning Stations ● Differential Learning Activities (Ex: Walk-Arounds, Riddles, etc.)		

Instructional/Assessment Scaffolds *(Modifications /Accommodations) – planned for prior to instruction*	**English Language Learners**	**Special Education Learners**	**Struggling Learners**	**Advanced Learners**
	● Oral Directions (repeat if necessary) ● Strategies for Reading Mathematics ● Underline/highlight key vocabulary and instructions ● Calculator ● Complete set of notes (if needed) ● Test retakes	● Oral Directions (repeat if necessary) ● Preferred Seating ● Calculator ● Complete set of notes (if needed) ● Manipulatives ● Learning Stations to differentiate	● Group work ● Calculators ● Guided practice worksheets with work shown ● Test corrections (when needed) ● Small group work with the teacher ● Provide study guides ● Additional time	● Flexible grouping to enhance learning ● Solving multi-step problems ● Tiered activities/assessment

		between radical operations ● Test retakes ● Extra time ● Modified testing (if needed)	
Differentiated Instructional Methods: *(Multiple means for students to access content and multiple modes for student to express understanding)*	**Access** (Resources and/or Process) ● Guided notes ● Provide list of perfect squares and cubes to aid students in simplifying radicals ● Demonstrations for key concepts ● Provide Khan Academy and other websites with additional examples		**Expression** (Products and/or Performance) ● Real-world applications (Compositions of Functions)
Vocabulary *Highlight key vocabulary (both Tier II and Tier III words)*	Tier II: indicate, evaluate, simplify, write Tier III: nth root of a, index of a radical, radicals, power function, composition, inverse relation, inverse function, radical function, parent function, radical equation, extraneous solution		
Integration of Technology SAMR	S: Google Classroom Assignments S, A, and M: Khan Academy		
Interdisciplinary Connections NJ Student Learning Standards	**Career Ready Practices:** ● **CRP2** - Apply appropriate academic and technical skills. **ELA:** ● **NJSLSA.W4** Produce clear and coherent writing in which the development, organizer, and style are		

	appropriate to task, purpose, and procedure.	
21st Century Themes/Skills P21 Framework	Themes	Skills
	● Financial Literacy (compositions of real-world applications)	● Information & Communication Technologies Literacy ● Communication & Collaboration
Resources/Materials	**Resources:** ● Larson Algebra 2 Textbook (Holt McDougal Common Core Edition) ● Google Classroom ● Teacher-generated worksheets and activities (practice, stations, etc.) ● Teacher-generated notes ● Teacherspayteachers.com (Scavenger Hunt, riddle) ● Khan Academy **Materials:** ● Chromebooks ● Manipulatives ● Graphing Calculators	

Instructional Unit Map

Course Title: Algebra II A

Unit Title	Exponential and Logarithmic Functions		Start Date:	December/May
			Length of Unit:	2-2.5 weeks

Content Standards *What do we want them to know, understand, & do?*	NJSLS.A.SSE.B.3 - Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. NJSLS.F.LE.A.4 - . Understand the inverse relationship between exponents and logarithms. For exponential models, express as a logarithm the solution to $ab^{ct} = d$ where *a*, *c*, and *d* are numbers and the base *b* is 2, 10, or *e*; evaluate the logarithm using technology.	Learning Goals	The students will be able to use the properties of exponents to transform expressions for exponential functions. The students will understand the inverse relationship between exponents and logarithms and use this relationship to solve problems.

	NJSLS.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. NJSLS.F.BF.B.4 - Find inverse functions. NJSLS.F.BF.B.5 - Use the inverse relationship between exponents and logarithms to solve problems involving logarithms and exponents. NJSLS.F.LE.B.5 - Interpret the parameters in a linear or exponential function in terms of a context.		

Essential Questions	● *What is the difference between exponential growth and decay?* ● *How are logarithms and exponents related?* ● *How can exponential growth and decay functions be used to model real-world applications?*

Assessments *How will we know they have gained the knowledge & skills?*	Formative	Summative	Alternative
	● Warm-ups/exit tickets ● Graded homework and classwork assignments ● Group work	● Quizzes ● Chapter Test	● CSI: Algebra 2 Exponential & Log Functions https://www.teacherspa

	● Teacher observation ● Class participation			yteachers.com/Product/CSI-Algebra-2-Pre-Calc-Unit-6-Exponential-Log-Functions-757315
Unit Pre-Assessment(s) *What do they already know?*	● Warm-Up Chapter 4 Pre-Assessment (Algebra II Textbook) ● Chapter 4 *Skills Readiness* practice			
Instructional Strategies/Student Activities	● Direct Instruction ● Note-taking sheet ● Guided Practice ● Cooperative Learning (group work) ● Learning Stations ● Differential Learning Activities (Ex: Color-by-Number, Puzzles, CSI, Scavenger Hunt, etc.)			

Instructional/Assessment Scaffolds *(Modifications /Accommodations) – planned for prior to instruction*	**English Language Learners**	**Special Education Learners**	**Struggling Learners**	**Advanced Learners**
	● Oral Directions (repeat if necessary) ● ELL Lesson Notes ● Simplify language and present directions in bullet-point form ● Calculator ● Shorten assignments (if needed)	● Calculator ● Complete set of notes (if needed) ● Provide formula sheet to assist with switching between exponential and	● Group work ● Calculators ● Test corrections (when needed) ● Highlight key terms/phrases in directions ● Provide formula sheet to assist with switching between exponential and logarithmic forms ● Provide Khan Academy	● Tiered activities and assessment

	● Test retakes	logarithmic forms ● Test retakes/corrections ● Extra time ● Modified testing (if needed)	videos to use as extra practice	

Differentiated Instructional Methods: *(Multiple means for students to access content and multiple modes for student to express understanding)*	**Access** (Resources and/or Process)	**Expression** (Products and/or Performance)
	● Learning stations ● Read word problems aloud to discuss key words and concepts ● Highlight/underline key information in exponential growth/decay problems ● Concrete examples ● Graphic organizers for key objectives in this unit	● Independent/extension studies on real-world applications of growth and decay ● Create test questions and provide answers to be used on assessments

Vocabulary *Highlight key vocabulary (both Tier II and Tier III words)*	Tier II: growth, decay, function, compound interest, domain, range Tier III: exponential function, exponential growth function, exponential decay function, growth factor, decay factor, common logarithm, natural logarithm, asymptote, natural base e, exponential equation, logarithmic equation
Integration of Technology SAMR	S: Google Classroom Assignments S, A, and M: Khan Academy A and M: Desmos.com

Interdisciplinary Connections	Technology:
NJ Student Learning Standards	● **NJSLS.2.12.B.2** Evaluate ethical considerations regarding the sustainability of environmental resources that are used for the design, creating and maintenance of a chosen product.
	Career Ready Practices:
	● **CRP1** - Act as a responsible and contributing citizen and employee.
	● **CRP2** - Apply appropriate academic and technical skills.
	● **CRP6** - Demonstrate creativity and innovation.
	● **CRP8** - Utilize critical thinking to make sense of problems and persevere in solving them.
	● **CRP11** - Use technology to enhance productivity.
	● **CRP12** - Work productively in teams while using cultural global competence.
	Financial Literacy:
	● **NJSLS.9.1.12.A.9** Analyze how personal and cultural values impact spending and other financial decisions.
	● **NJSLS.9.1.12.B.2** Identify age appropriate financial goals.
	● **NJSLS.9.1.12.B.8** Develop a system for keeping and using financial records.
	ELA:
	● **NJSLSA.R1** Read closely to determine what the text says explicitly and to make logical inferences and relevant connections from it.
	● **NJSLSA.R4** Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.
	Science:
	● **NJSLS-S.HS-LS3-3** Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.
21ˢᵗ Century Themes/Skills P21 Framework	Themes Skills

	● Financial Literacy ● Environmental Literacy	● Life and Career Skills ● Communication & Collaboration ● Information Literacy
Resources/Materials	**Resources:** ● Larson Algebra 2 Textbook (Holt McDougal Common Core Edition) ● Google Classroom ● Teacher-generated worksheets and activities (practice, stations, etc.) ● Teacher-generated notes and graphic organizer ● Teacherspayteachers.com (Scavenger Hunt, CSI, Color-by-Number) ● Algebra II Topics by Design ● Desmos.com ● Khan Academy **Materials:** ● Chromebooks ● Graphic organizer ● Graphing Calculators	

Instructional Unit Map			
Course Title: Algebra II A			
Unit Title	**Rational Functions**	**Start Date:**	January/June
		Length of Unit:	2-3 weeks

Content Standards	NJSLS.A.APR.D.7-	Learning Goals	The students will write and use models for inverse variation, direct variation, and joint variation.
What do we want them to know, understand, & do?	Understand that rational expressions form a system analogous to the rational numbers, closed under addition, subtraction, multiplication, and division by a nonzero rational expression; add, subtract, multiply, and divide rational expressions.		The students will graph rational functions, multiply, divide, add, and subtract rational expressions, and simplify complex fractions.
			The students will solve rational expressions.
	NJSLS.F.IF.7D - Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.		
	NJSLS.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. NJSLS.A.REI.2 - Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.		

Essential Questions	● *How is direct, inverse, and joint variation used in everyday life?* ● *What are the steps in order to add, subtract, multiply, and divide rational expressions? Why do you need to know how to solve a rational equation?*

Assessments *How will we know they have gained the knowledge & skills?*	Formative	Summative	Alternative
	● Warm-ups/exit tickets ● Graded homework and classwork assignments ● Teacher observation ● Class participation ● Independent work on real-world variation problems	● Quizzes ● Chapter Test	● Unit Menu Activity ● Creating real-world variation problems and providing answers to own problem. Have peers answer problems.

Unit Pre-Assessment(s) *What do they already know?*	● Warm-Up Chapter 5 Pre-Assessment (Algebra II Textbook) ● Chapter 5 *Skills Readiness* practice

Instructional Strategies/Student Activities	● Direct Instruction ● Note-taking sheet ● Modeling (applications of variations)

	● Guided Practice (applications of variations) ● Cooperative Learning (group work) ● Learning Stations to break down different variations and operations ● Menu Activity			
Instructional/Assessment Scaffolds *(Modifications /Accommodations) – planned for prior to instruction*	**English Language Learners**	**Special Education Learners**	**Struggling Learners**	**Advanced Learners**
	● Oral Directions (repeat if necessary) ● ELL Lesson Notes ● Calculator ● Test retakes ● Key words underlined to determine the correct operation to use/variation	● Calculator ● Complete set of notes (if needed) ● Key words underlined to determine the correct operation to use/variation ● Test retakes/corrections ● Extra time ● Modified testing (if needed)	● Group work ● Calculators ● Key words underlined to determine the correct operation to use/variation ● Test corrections (when needed)	● Creating real-world variation problems and providing answers to own problem. Have peers answer problems.

Differentiated Instructional Methods: *(Multiple means for students to access content and multiple modes for student to express understanding)*	**Access** (Resources and/or Process)	**Expression** (Products and/or Performance)
	- Learning stations - Menu Activity - Group work	- Creation of own application problems - Solving peer-created application problems
Vocabulary *Highlight key vocabulary (both Tier II and Tier III words)*	Tier II: decreasing, increasing, variation Tier III: constant of variation, complex fraction, cross multiplying, even function, odd function, inverse variation, joint variation, direct variation, rational function	
Integration of Technology SAMR	S: Google Classroom Assignments S, A, and M: Khan Academy	
Interdisciplinary Connections NJ Student Learning Standards	**Career Ready Practices:** **CRP2** - Apply appropriate academic and technical skills. **CRP6** - Demonstrate creativity and innovation. **CRP8** - Utilize critical thinking to make sense of problems and persevere in solving them. **CRP12** - Work productively in teams while using cultural global competence.	
21st Century Themes/Skills P21 Framework	Themes	Skills
	Environmental Literacy	- Life and Career Skills - Communication & Collaboration
Resources/Materials	**Resources:** - Larson Algebra 2 Textbook (Holt McDougal Common Core Edition) - Google Classroom - Teacher-generated worksheets and activities (practice, stations, etc.)	

	● Teacher-generated notes ● Teacherspayteachers.com (Applications, Gone Fishing (operations), etc.) ● Khan Academy **Materials:** ● Chromebooks ● Smartboard (Gone Fishing) ● Graphing Calculators