Algebra 2 Level B Unit 3

Marking Period	Unit Title	Recommended Instructional Days
1	Exponential Functions	5-7 days

Domain: Algebra, Functions, Statistics and Probability

NJSLS Strand:

Key:

Major Cluster

Supporting Cluster

Additional Clust

A-SSE.A.1. Interpret expressions that represent a quantity in terms of its context.*
a. Interpret parts of an expression, such as terms, factors, and coefficients.
b. Interpret complicated expressions by viewing one or more of their parts as a single entity. For example, interpret $P(1 + r)^n$ as the product of P and a factor not depending on P.

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

Progress Indicator:
Tests ● Quizzes ● Practice problems for homework ● Online textbook ● Worksheets ● Leveled assessments

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

Essential Question/s:
How do you use exponential functions to model situations and solve problems?
How do you determine the difference between an exponential and a linear function?

Activity Description:
Writing Exponential Functions from tables
Exponential Growth and Decay
Linear vs. Exponential Functions

Interdisciplinary Connections: Financial Literacy
On federal income tax returns, self-employed people can depreciate the value of business equipment. Suppose a computer valued at $2765 depreciates at a rate of 30% per year. Estimated the number of years it will take for the computer's value to be less than $350.

Answer:
About 5.8 years

Content: Money Management
NJSLS#: HS-CLKS-9.1.12.B.2

Example Tasks:

example, see $x^4 - y^4$ as $(x^2)^2 - (y^2)^2$, thus recognizing it as a difference of squares that can be factored as $(x^2 - y^2)(x^2 + y^2)$. **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. c. Use the properties of exponents to transform expressions for exponential functions. **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-CED.A.2** Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.		**Task 1:** Tell whether the function shows growth or decay. a) $f(x) = 32(0.5)^x$ b) $f(x) = 0.5(1.2)^x$ c) $f(x) = 0.4(\frac{3}{4})^x$ **Answer:** a) decay b) growth c) decay **Task 2:** Write an exponential equation from the given table: x | y 0 | 4 1 | 12 2 | 36 3 | 108 4 | 324 **Answer:** $y = 4(3)^x$ **Task 3:** **Tony purchased a rare 1959 Gibson Les Paul guitar in 2000 for $12,000. Experts estimate that its value will increase by 14% per year. Use a graph to find when the value of the guitar will be $60,000.** **Answer:**

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. **A-REI.A.1** Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method. **A-REI.D.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 solutions approximately; e.g., using technology to graph functions, make tables of values, or find successive		The function value is approximately 60,000 when $t \approx 12.29$. The guitar will be worth \$60,000 about 12.29 years after it is purchased, or sometime in 2012. **At the end of each topic please review the Assessment Practice and Performance Tasks questions.** ASSESSMENT PRACTICE The population of a town was 89,443 in 1990 and has increased at a rate of 0.6% per year since then. Which function represents the town's population t years after 1990? A $89{,}443(1.6)^t$ B $89{,}443(1.006)^t$ C $89{,}443(1.06)^t$ D $89{,}443(1.0006)^t$ **Performance Task** The student population in a small resort town has increased by 2% per year for the last 5 years. This year's population is 765 students. a) Will the function that represents this situation show growth or decay? b) Suppose that the student population continues to follow the same trend. Write a function to show the number of students as a function of the year, starting with the current year. c) Graph the function. d) Use the graph to predict the number of students in 5 years. e) When will the population exceed 1000 students?

approximations. Include cases where f(x) and/or g(x) are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.* **F-IF.A.1** 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 in a verbal description of the relationship. *Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.** **F-IF.B.5** Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. For example, if the function *h(n)* gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an		**Spot Light on: LGBT&Q** **Richard Merritt Montague**: an American mathematician and philosopher who made contributions to mathematical logic and the philosophy of language. He is known for proposing Montague grammar to formalize semantics of natural language. Climate Change Example: Students may create equations and/or inequalities to represent the economic impact of climate change. 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. Climate Change Example: Students may relate the domain of a function c(m) representing the amount of carbon dioxide produced by burning m molecules of ethane (gasoline), to its graph in order to determine the appropriate domain for c(m).

appropriate domain for the function. ★ 🌿 **F-IF.C.7.** Graph functions expressed symbolically and show key features if the graph, by hand in simple cases and using technology for more complicated cases.* a. Graph linear and quadratic functions and show intercepts, maxima, and minima b.Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions. c.Graph polynomial functions, identifying zeros, when suitable factorizations are available, and showing end behavior. d.(+) Graph rational functions, identifying zeros, and asymptotes when suitable factorizations are available, and showing end behavior. e.Graph exponential and logarithmic functions, showing intercepts and end behavior,		

and trigonometric functions, showing period, midline, and amplitude. **F-IF.C.8** Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. b. Use the properties of exponents to interpret expressions for exponential functions. *For example, identify percent rate of change in functions such as* $y = (1.02)^t$, $y = (0.97)^t$, $y = (1.02)^{12t}$, $y = (1.2)^{t/10}$, *and classify them as representing exponential growth and decay.* **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. *Include recognizing even and odd functions from their graphs and algebraic expressions for them.* **F-LE.A.3**. Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function		
Mathematics Practices		
1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reason 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.		
Social and Emotional Learning: ***Competencies***	**Social and Emotional Learning:** ***Sub-Competencies***	

Self- awareness Social Awareness Self- Management Relationship Skills Responsible Decision-Making	Recognizing the importance of self-confidence in handling daily tasks and challenges. Demonstrate an awareness of the expectations for social interactions in a variety of ways. Demonstrate an understanding of the need for mutual respect when viewpoints differ. Recognize the skills needed to establish and achieve personal and educational goals. Utilize positive communication and social skills to interact effectively with others. Develop, implement, and model effective problem solving and critical thinking skills.	

Assessments (Formative) ***To show evidence of meeting the standard/s, students will successfully engage within:***	**Assessments (Summative)** ***To show evidence of meeting the standard/s, students will successfully complete:***
<u>Formative Assessments:</u> ● Entry and Exit Slips ● Quizzes ● Self Assessments	**<u>Benchmarks:</u>** ● Chapter Tests ● Projects ● LinkIT **<u>Summative Assessments:</u>** ● District Assessments ● Midterms ● Standardized Tests
Differentiated Student Access to Content: **Teaching and Learning *Resources/Materials***	

Core Resources	Alternate Core Resources *IEP/504/At-Risk/ESL*	ELL Core Resources	Gifted & Talented Core Resources
• Savvas Envision • Achieve the core • Khan Academy • Desmos	• Skill building worksheets • Math Manipulatives	• Dictionary for native languages • Videos in their native language.	• Leveled Assessments • Enrichment worksheets

Supplemental Resources

Technology:
- **Chromebooks, Graphing Calculators, Smartboards**

Other:
- **Zoom and Google Meets, Schoology, Interactive Textbooks**

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

Core Resources	Alternate Core Resources *IEP/504/At-Risk/ESL*	ELL Core Resources	Gifted & Talented Core
• **Deliver instruction utilizing varied learning styles including audio, visual, and tactile/kinesthetic, provide individual instruction as needed, modify assessments and/or rubrics, repeat**	• **Utilize a multi-sensory (VAKT) approach during instruction, provide alternate presentations of skills by varying the method (repetition, simple explanations, additional examples, modeling, etc.), modify test content and/or format, allow students to retake test for additional credit, provide additional times and preferential seating as needed, review, restate and repeat directions, provide study**	• **Extend time requirements, preferred seating, positive reinforcement, check often for understanding/review, oral/visual directions/prompts when necessary, supplemental materials including use of an online bilingual dictionary, and modified assessment and/or rubric.**	• **Create an enhanced set of introductory activities, integrate active teaching/learning opportunities, incorporate authentic components, propose interest-based extension activities, and connect student to related**

	guides, and/or break assignments into segments of shorter tasks.		

NJSLS CAREER READINESS, LIFE LITERACIES & KEY SKILLS	**Disciplinary Concept: Creativity and Innovation**	
	Core Ideas:	**Solutions to the problems faced by a global society require the contribution of individuals with different points of view and experiences.**
	Performance Expectation/s:	**99.4.12.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).**
	Career Readiness, Life Literacies, & Key Skills Practices	
	Act as a responsible and contributing community member and employee. **Attend to financial well-being.** **Consider the environmental, social and economic impacts of decisions.** **Demonstrate creativity and innovation.** **Utilize critical thinking to make sense of problems and persevere in solving them.** **Model integrity, ethical leadership and effective management.** **Plan education and career paths aligned to personal goals.** **Use technology to enhance productivity, increase collaboration and communicate effectively.** **Work productively in teams while using cultural/global competence.**	

New Jersey Legislative Statutes and Administrative Code (place an "X" before each law/statute if/when present within the curriculum map)									
	Amistad Law: *N.J.S.A. 18A 52:16A-88*		Holocaust Law: *N.J.S.A. 18A:35-28*	X	LGBT and Disabilities Law: *N.J.S.A. 18A:35-4.35*		Diversity & Inclusion: *N.J.S.A. 18A:35-4.36a*	X	Standards in Action: *Climate Change*