

NJDOE MODEL CURRICULUM PROJECT

CONTENT AREA: Mathematics	COURSE: Algebra II	UNIT #: 3	UNIT NAME: Expressions and Equations (2)
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#	STUDENT LEARNING OBJECTIVES	CORRESPONDING CCSS
1	Find approximate solutions for the intersections of functions and 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 $f(x) = g(x)$ involving linear, polynomial, rational, absolute value, logarithmic and exponential functions. ★	A.REI.11
2	Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms. ★	F.BF.2
3	Determine the inverse function for a simple function that has an inverse and write an expression for the inverse.	F.BF.4a
4	Graph exponential, logarithmic and trigonometric functions expressed symbolically or verbally and show key features of the graph (including intercepts, intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity) by hand in simple cases and using technology for more complicated cases. ★	F.IF.4 F.IF.7e N.Q.2
5	Interpret the parameters in a linear or exponential function in terms of a context.	F.LE.5
6	Represent and describe data for two variables on a scatter plot, fit a function to the data, analyze residuals (in order to informally assess fit), and use the function to solve problems. <i>Use given functions or choose a function suggested by the context. Emphasize linear and exponential models.</i>	S.ID.6a
7	Understand the radian measure of an angle as the length of the arc on the unit circle subtended by the angle.	F.TF.1
8	Explain how the unit circle in the coordinate plane enables the extension of trigonometric functions to all real numbers (interpreted as radian measures of angles traversed counterclockwise around the unit circle) and use the Pythagorean Identity $(\sin \theta)^2 + (\cos \theta)^2 = 1$ to find $\sin \theta$, $\cos \theta$, or $\tan \theta$, given $\sin \theta$, $\cos \theta$, or $\tan \theta$, and the quadrant of the angle. ★	F.TF.2 F.TF.8
9	Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline. ★	F.TF.5

Major Content **Supporting Content** **Additional Content** (Identified by PARCC Model Content Frameworks).

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Bold type indicates grade level fluency requirements. (Identified by PARCC Model Content Frameworks).

Selected Opportunities for Connection to Mathematical Practices

1. Make sense of problems and persevere in solving them.
2. **Reason abstractly and quantitatively.**
SLO 8 Make connections between the unit circle and trigonometric functions.
3. Construct viable arguments and critique the reasoning of others.
4. **Model with mathematics.** *
5. Use appropriate tools strategically.
6. **Attend to precision.**
SLO 8 Use precise language to explain why trigonometric functions are radian measures of angles traversed counter-clockwise around the unit circle.
7. **Look for and make use of structure.**
SLO 3 Use the structure of a function to determine if it has an inverse.
8. Look for and express regularity in repeated reasoning.

All of the content presented in this course has connections to the standards for mathematical practices.

* This course includes the exponential and logarithmic functions as modeling tools. (PARCC Model Content Frameworks)

Bold type identifies possible starting points for connections to the SLOs in this unit.

Code #	Common Core State Standards
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N.Q.2	Define appropriate quantities for the purpose of descriptive modeling.
A.REI.11	Explain why the x -coordinates of the points where the graphs of the equations $y = f(x)$ and $y = g(x)$ intersect are the solutions of the equation $f(x) = g(x)$; find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where $f(x)$ and/or $g(x)$ are linear, polynomial, rational, absolute value, exponential, and logarithmic functions. ★
F.BF.2	Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms. ★
F.BF.4a	Find inverse functions. a. Solve an equation of the form $f(x) = c$ for a simple function f that has an inverse and write an expression for the inverse. <i>For example, $f(x) = 2x^3$ or $f(x) = (x+1)/(x-1)$ for $x \neq 1$</i>
F.IF.4	For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. <i>Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.</i> ★
F.IF.7e	Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. ★ e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude,
F.LE.5	Interpret the parameters in a linear or exponential function in terms of a context.
F.TF.1	Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle.
F.TF.2	Explain how the unit circle in the coordinate plane enables the extension of trigonometric functions to all real numbers, interpreted as radian measures of angles traversed counterclockwise around the unit circle.
F.TF.5	Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline. ★
F.TF.8	Prove the Pythagorean identity $\sin^2(\theta) + \cos^2(\theta) = 1$ and use it to find $\sin(\theta)$, $\cos(\theta)$, or $\tan(\theta)$ given $\sin(\theta)$, $\cos(\theta)$, or $\tan(\theta)$ and the quadrant of the angle.
S.ID.6a	Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. <i>Use given functions or choose a function suggested by the context. Emphasize linear and exponential models.</i>

Major Content **Supporting Content** **Additional Content** (Identified by PARCC Model Content Frameworks).

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