Mohawk Local Schools Algebra II

Quarter 2 Curriculum Guide

Mathematical Practices

1. Make Sense of Problems and Persevere in Solving them
2. Reasoning Abstractly & 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

Critical Areas of Focus Being Addressed:

- Modeling with Functions

A.CED.1 Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions. [DOK 2]	DOK 1: Solve all available types of equations & inequalities, including root equations & inequalities, in one variable. Describe the relationships between the quantities in the problem (for example, how the quantities are changing or growing with respect to each other); express these relationships using mathematical operations to create an appropriate equation or inequality to solve. DOK 2: Create equations and inequalities in one variable and use them to solve problems.

	Create equations and inequalities in one variable to model real-world situations. Compare and contrast problems that can be solved by different types of equations. Note from Appendix A: Use all available types of functions to create such equations, including root functions, but constrain to simple cases.
A.CED.2 Create equations in two or more variables to represent relationships between quantities, graph equations on a coordinate axes with labels and scales. [DOK2]	DOK 1: Identify the quantities in a mathematical problem or real world situation that should be represented by distinct variables and describe what quantities the variables represent. Graph one or more created equation on a coordinate axes with appropriate labels and scales. Note from Appendix A: (While functions used in A.CED.2will often be linear, exponential, or quadratic the types of problems should draw from more complex situations than those addressed in Algebra I. For example, finding the equation of a line through a given point perpendicular to another line allows one to find the distance from a point to a line.) DOK 2: Create at least two equations in two or more variables to represent relationships between quantities Justify which quantities in a mathematical problem or real-world situation are dependent and independent of one another and which operations represent those relationships. Determine appropriate units for the labels and scale of a graph depicting the relationship between equations created in two or more variables.
A.CED.3 Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. [DOK 2]	DOK 1: Recognize when a modeling context involves constraints. Note from Appendix A: While functions used will often be linear, exponential, or quadratic the types of problems should draw from more complex situations than those addressed in

	Algebra I. For example, finding the equation of a line through a given point perpendicular to another line allows one to find the distance from a point to a line. DOK 2: Interpret solutions as viable or nonviable options in a modeling context. Determine when a problem should be represented by equations, inequalities, systems of equations and/ or inequalities. Represent constraints by equations or inequalities, and by systems of equations and/or inequalities. Note from Appendix A: While functions used will often be linear, exponential, or quadratic the types of problems should draw from more complex situations than those addressed in Algebra I. For example, finding the equation of a line through a given point perpendicular to another line allows one to find the distance from a point to a line.
A.CED.4 Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. For example, rearrange Ohm's law V = IR to highlight resistance R. [DOK 2]	DOK 1: Define a "quantity of interest" to mean any numerical or algebraic quantity (e.g. 2(a/b)=d , in which 2 is the quantity of interest showing that d must be even;$1/3\pi r^2 h$=$V_{cone}$and $\pi r^2 h = Vcylinder$showing that 3Vcone= Vcylinder) DOK 2: Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. (e.g. π r2 can be re-written as (π r)r which makes the form of this expression resemble bh. The quantity of interest could also be (a +b)n = a n b 0 + a(n-1)b 1 + … + a0 b n). Note from Appendix A: While functions used will often be linear, exponential, or quadratic the types of problems should draw from more complex situations than those addressed in Algebra I. For example, finding the equation of a line through a given point perpendicular to another line allows one to find the distance from a point to a line. Note that the example given for A.CED.4 applies to earlier instances of this standard,

	not to the current course.
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. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity. *(Modeling standard) [DOK 2]	DOK 1: Define and recognize the key features in tables and graphs of linear, exponential, and quadratic functions: intercepts; intervals where the function is increasing, decreasing, positive, or negative, relative maximums and minimums, symmetries, end behavior and periodicity. Identify the type of function, given its table or graph. Notes from Appendix A: Emphasize the selection of a model function based on behavior of data and context. DOK 2: Interpret key features of graphs and tables of functions in the terms of the contextual quantities the function represents. Sketch graphs showing key features of a function that models a relationship between two quantities from a given verbal description of the relationship. Notes from Appendix A: Emphasize the selection of a model function based on behavior of data and context.
F.IF.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 appropriate domain for the function [DOK 2]	DOK 1: Given the graph or a verbal/written description of a function, identify and describe the domain of the function. Identify an appropriate domain based on the unit, quantity, and type of function it describes. Notes from Appendix A: Emphasize the selection of a model function based on behavior of data and context. DOK 2: Relate the domain of the function to its graph and, where applicable, to the quantitative relationship it describes. Explain why a domain is appropriate for a given situation.
F.IF.7e Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using	DOK 1: Graph exponential, logarithmic, and trigonometric functions,

technology for more complicated cases.*(Modeling standard) e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude. [DOK 2]	by hand in simple cases or using technology for more complicated cases, and show intercepts and end behavior for exponential and logarithmic functions, and for trigonometric functions, show period, midline, and amplitude. Note from the Appendix A: Focus on applications and how key features relate to characteristics of a situation, making selection of a particular type of function model appropriate DOK 2: Analyze the difference between simple and complicated linear, quadratic, square root, cube root, piecewise-defined, exponential, logarithmic, and trigonometric functions, including step functions and absolute value functions and know when the use of technology is appropriate. Compare and contrast the domain and range of exponential, logarithmic, and trigonometric functions with linear, quadratic, absolute value, step and piece-wise defined functions. Select the appropriate type of function, taking into consideration the key features, domain, and range, to model a real-world situation.
F.IF.8b 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 $y= (1.02)^t$, $y=(.97)^t$, $y=(1.01)^{12t}$, $y=(1.2)^{t/10}$, and classify them as representing exponential growth or decay. [DOK 2]	DOK 1: Identify how key features of an exponential function relate to characteristics of in a real-world context. DOK 2: Given the expression of an exponential function, use the properties of exponents to interpret the expression in terms of a real-world context. Write an exponential function defined by an expression in different but equivalent forms to reveal and explain different properties of the function, and determine which form of the function is the most appropriate for interpretation for a real-world context. Note from Appendix A: Focus on applications and how key features relate to characteristics of a situation, making

	selection of a particular type of function model appropriate.
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. [DOK 2]	DOK 1: Identify types of functions based on verbal , numerical, algebraic, and graphical descriptions and state key properties (e.g. intercepts, maxima, minima, growth rates, average rates of change, and end behaviors) Differentiate between different types of functions using a variety of descriptors (graphically, verbally, numerically, and algebraically) Note from Appendix A: Focus on applications and how key features relate to characteristics of a situation, making selection of a particular type of function model appropriate. DOK 2: Use a variety of function representations (algebraically, graphically, numerically in tables, or by verbal descriptions) to compare and contrast properties of two functions
F.BF.1b Write a function that describes a relationship between two quantities.*(Modeling standard) b. Combine standard function types using arithmetic operations. For example, build a function that models the temperature of a cooling body by adding a constant function to a decaying exponential, and relate these functions to the model. [DOK 2]	DOK 1: Combine two functions using the operations of addition, subtraction, multiplication, and division Evaluate the domain of the combined function. Note from Appendix A: Develop models for more complex or sophisticated situations than in previous courses. DOK 2: Given a real-world situation or mathematical problem: • build standard functions to represent relevant relationships/ quantities • determine which arithmetic operation should be performed to build the appropriate combined function • relate the combined function to the context of the problem Note from Appendix A: Develop models for more complex or sophisticated situations than in previous courses.
F.BF.3 Identify the effect on the graph of replacing f(x) by f(x) + k, k f(x), f(kx), and f(x + k) for specific values of k (both positive and negative); find the value of k given the graphs.	DOK 1: Given a single transformation on a function (symbolic or graphic) identify the effect on the graph.

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. [DOK 2]	Using technology, identify effects of single transformations on graphs of functions. Graph a given function by replacing f(x) by f(x) + k, k f(x), f(kx), and f(x + k) for specific values of k (both positive and negative). Note from Appendix A: Use transformations of functions to find models as students consider increasingly more complex situations. Note the effect of multiple transformations on a single graph and the common effect of each transformation across function types. DOK 2: Describe the differences and similarities between a parent function and the transformed function. Find the value of k, given the graphs of a parent function, f(x), and the transformed function: f(x) + k, k f(x), f(kx), or f(x + k). Recognize even and odd functions from their graphs and from their equations. Experiment with cases and illustrate an explanation of the effects on the graph using technology.
F.BF. 4a Find the 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. For example:f(x)= $2x^3$ or f(x) = (x+1)/(x-1) for x ≠ 1. [DOK 1]	DOK 1: 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. Note from Appendix A: Extend the set of functions to simple rational, simple radical and simple exponential functions; connect F.BF.4a to F.LE.4.
F.LE.4 For exponential models, express as a logarithm the solution to ct a b d · = , where a, b, and d are numbers and the base is 2, 10, or e; evaluate the logarithm using technology. [DOK 2]	DOK 1: Recognize the laws and properties of logarithms, including change of base. Recognize and describe the key features logarithmic functions. Recognize and know the definition of logarithm base b. Evaluate a logarithm using technology DOK 2: For exponential models, express as a logarithm the solution to

	ct a b d · = , where a, b, and d are numbers and the base is 2, 10, or e.