MOHAWK
Local School District
Preparing today's students for tomorrow's challenges

Mohawk Local Schools Algebra II

Quarter 1 Curriculum Guide

<u>Mathematical Practices</u>

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:

- Polynomial, Radical and Rational Relationships

There will be a review of Linear Relations and Functions and also solving Systems of Equations.	
N.CN.1 Know there is a complex number i such that $i^2 = -1$, and every complex number has the form a + bi with a and b real numbers. [DOK 1]	DOK 1: Define i as $\sqrt{-1}$ or i 2 = -1. Define complex numbers. Write complex numbers in the form a + bi with a and b being real numbers.
N.CN.2 Use the relation $i^2 = -1$ and the commutative,	DOK 1:

associative, and distributive properties to add, subtract, and multiply complex numbers. [DOK 1]	Know that the commutative, associative, and distributive properties extend to the set of complex numbers over the operations of addition and multiplication. Use the relation i 2 = -1 and the commutative, associative, and distributive properties to add, subtract, and multiply complex numbers.
N.CN.7 Solve quadratic equations with real coefficients that have complex solutions. [DOK 1]	DOK 1: Solve quadratic equations with real coefficients that have complex solutions. Note from Appendix A: Limit to polynomials with real coefficient
A.SSE.1a Interpret expressions that represent a quantity in terms of its context.*(*Modeling standard) a. Interpret parts of an expression, such as terms, factors, and coefficients [DOK 2]	DOK 1: For expressions that represent a contextual quantity, define and recognize parts of an expression, such as terms, factors, and coefficients. Note from Appendix A: extend to polynomial & rational expressions DOK 2: For expressions that represent a contextual quantity, interpret parts of an expression, such as terms, factors, and coefficients in terms of the context. Note from Appendix A: extend to polynomial & rational expressions
A.SSE.1b Interpret expressions that represent a quantity in terms of its context.*(Modeling standard) b. Interpret complicated expressions by viewing one or more of their parts as a single entity. For example, interpret as the product of P and a factor not depending on $P(1+r)^n$ [DOK 2]	DOK 1: The underpinning knowledge for this standard is addressed in A.SSE.1a: For expressions that represent a contextual quantity, define and recognize parts of an expression, such as terms, factors, and coefficients. Note from Appendix A: extend to polynomial and rational expressions

	DOK 2: For expressions that represent a contextual quantity, interpret complicated expressions, in terms of the context, by viewing one or more of their parts as a single entity. Note from Appendix A: extend to polynomial and rational expressions
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 difference of squares that can be factored as $(x^2 - y^2)(x^2 + y^2)$. [DOK 2]	DOK 1: Identify ways to rewrite expressions, such as difference of squares, factoring out a common monomial, regrouping, etc. Identify various structures of expressions (e.g. an exponential monomial multiplied by a scalar of the same base, difference of squares in terms other than just x) Note from Appendix A: Extend to polynomial and rational expressions. DOK 2: Use the structure of an expression to identify ways to rewrite it. Classify expressions by structure and develop strategies to assist in classification (e.g. use of conjugates in rewriting rational expressions, usefulness of Pythagorean triples, etc.). Note from Appendix A: Extend to polynomial and rational expressions.
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. [DOK 1]	DOK 1: Identify that the sum, difference, or product of two polynomials will always be a polynomial, which means that polynomials are closed under the operations of addition, subtraction, and multiplication. Define “closure”. Apply arithmetic operations of addition, subtraction, and multiplication to polynomials. Note from Appendix A: Algebra 2 should extend beyond the quadratic polynomials found in Algebra I.

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). [DOK 2]	DOK 1: Define the remainder theorem for polynomial division and divide polynomials. DOK 2: Given a polynomial p(x) and a number a, divide p(x) by (x – a) to find p(a) then apply the remainder theorem and conclude that p(x) is divisible by x – a if and only if p(a) = 0.
A.APR.3 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. [DOK1]	DOK 1: When suitable factorizations are available, factor polynomials using any available methods. Create a sign chart for a polynomial f(x) using the polynomial's x-intercepts and testing the domain intervals for which f(x) greater than and less than zero. Use the x-intercepts of a polynomial function and the sign chart to construct a rough graph of the function.
A.APR.4 Prove polynomial identities and use them to describe numerical relationships. For example, the polynomial identity $(x^2 + y^2)^2 = (x^2 - y^2)^2 + (2xy)^2$ can be used to generate Pythagorean triples.	DOK 1: Explain that an identity shows a relationship between two quantities, or expressions, that is true for all values of the variables, over a specified set. DOK 2: Prove polynomial identities. Use polynomial identities to describe numerical relationships.
A.APR.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. [DOK 1]	DOK 1: Use inspection to 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). Use long division to 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). Use a computer algebra system to rewrite complicated 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).
A.REI.2 Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise. [DOK 2]	DOK 1: Determine the domain of a rational function. Determine the domain of a radical function. Solve radical equations in one variable. Solve rational equations in one variable. DOK 2: Give examples showing how extraneous solutions may arise when solving rational and radical equations.
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.*(*Modeling standard) [DOK 2]	DOK 1: Recognize and use function notation to represent linear, polynomial, rational, absolute value, exponential, and radical equations. DOK 2: Explain why the x-coordinates of the points where the graph of the equations y=f(x) and y=g(x) intersect are the solutions of the equations f(x)=g(x). Approximate/find the solution(s) using an appropriate method for example, using technology to graph the functions, make tables of values or find successive approximations. Note from Appendix A: Include combinations of linear, polynomial, rational, radical, absolute value, and exponential functions.
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.
F.IF.6 Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a	DOK 1: Recognize slope as an average rate of change.

specified interval. Estimate the rate of change from a graph.*(Modeling standard) [DOK 2]	Calculate 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. Note from the Appendix A: Emphasize the selection of a model function based on behavior of data and context. DOK 2: Interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval.
F.IF.7c Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.*(Modeling standard) c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior. [DOK 2]	DOK 1: Graph exponential, logarithmic, and trigonometric functions, 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	DOK 1: Identify how key features of an exponential function relate to characteristics of in a real-world context.

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 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. 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 $x \neq 1$. [DOK 1]	DOK 1: Define inverse function. 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.