

National HSMS Algebra 2  
2020-2021 MATHia Enhancements



	Module	Textbook Topic	MATHia Unit	MATHia Workspace	Description	Enhancements
1	Analyzing Structure	Topic 1: Exploring and Analyzing Patterns	Observing Patterns	Exploring and Analyzing Patterns	Students watch a video about a well-known mathematician creating an expression for the sum of a sequence of numbers from a pattern he noticed and then answer questions that move them from a numerical expression to an algebraic one. Next, students analyze three different patterns to generate linear, exponential, and quadratic algebraic expressions.	NEW UNIT NAME: Formerly, <i>Searching for Patterns</i>
				Identifying Key Characteristics of Graphs of Functions	Students will identify key characteristics from the graph of a function, such as the intercepts, minimum and maximum x-values, minimum and maximum y-values, domain, and range.	NEW LOCATION: Formerly in <i>Graphs of Functions</i> unit
			Forms of Quadratic Functions	Examining the Shape and Structure of Quadratic Functions	Students sort functions based upon whether they are written in standard, factored or vertex form. They deal with each form independently, where they are guided as to how to identify key characteristics of the graph from the function. They identify the concavity and y-intercept from functions in standard form, the concavity and x-intercepts from functions in factored form, and the concavity, vertex, and axis of symmetry from functions in vertex form. Given graphs,	CONTENT CHANGES: The <b>Quadratic Equations Solving</b> and <b>Quadratic Transformations</b> workspace was relocated to later units as indicated below.

**National HSMS Algebra 2**  
2020-2021 MATHia Enhancements



					they use key characteristics to select the function that generates the graph.	
			Solving Quadratic Equations	Solving Quadratic Equations by Factoring	Students solve quadratic equations by factoring and applying the zero-product property.	NEW UNIT for 2020-2021 NEW LOCATION: This workspace was formerly in the <i>Polynomial Operations</i> unit.
				Quadratic Equation Solving	Students solve quadratic equations by using factoring or the quadratic formula.	NEW LOCATION: This workspace was formerly in the <i>Forms of Quadratic Functions</i> unit.
			Imaginary and Complex Numbers	Introduction to Complex Numbers	Students watch a video introducing them to the imaginary number line and its relation to the real number line. They then practice identifying real and imaginary numbers through the sorting tool. Finally, students are introduced to complex numbers and practice identifying them on the complex plane to help them understand that all numbers are complex, but some are real and some are purely imaginary.	NEW UNIT NAME: Formerly, <i>Operations with Complex Numbers</i>
		Topic 2: Composing and Decomposing Functions	Reviewing Function Transformations	Transforming Functions	Students use interactive Explore Tools to investigate transformations of linear, exponential, and quadratic functions, including horizontal and vertical translations and dilations. Students use the Explore Tools to solve real-world problems modeling changes to an exponential function describing doubling and to a quadratic function describing the height of a jump. In the final problems, students identify the graphs of transformations	NEW UNIT for 2020-2021 NEW WORKSPACE LOCATION: This workspace was formerly in the <i>Graphs of Functions</i> workspace.

					of quadratic functions based on their transformation equations.	
				Quadratic Transformations	Given a representation of a transformed function, students determine how the basic quadratic function was transformed to create the new function.	NEW WORKSPACE LOCATION: This workspace was formerly in the <i>Forms of Quadratic Functions</i> unit.
			Exploring Cubic Functions	Modeling Polynomial Functions	Students solve two problems in context involving polynomial, specifically, cubic functions. The first half of each problem requires students to use the function to solve for the dependent variable. The second half of the problem requires students to use the graph to solve for the independent variable and an interpret a minimum or maximum point on the graph.	NEW UNIT NAME: The workspace formerly entitled <i>Graphs of Polynomial Functions</i> was split into four units: <i>Exploring Cubic Functions</i> , <i>Power Functions</i> , <i>Key Characteristics of Polynomial Functions</i> , and <i>Analyzing and Comparing Polynomial Functions</i> . The workspaces were reordered slightly.
		Topic 3: Characteristics of Polynomial Functions	Power Functions	Analyzing Polynomial Functions	Students explore power functions, concentrating on cubics and quartics and the key characteristics of end behavior and extrema. They determine end behavior based upon whether the functions are even-degree or odd-degree and the sign of its leading term. They use graphs to determine extrema, relative maximum and minimums, and absolute maximums and minimums.	NEW UNIT for 2020-2021

**National HSMS Algebra 2**  
2020-2021 MATHia Enhancements



			Key Characteristics of Polynomial Functions	Identifying Key Characteristics of Polynomial Functions	Students identify key characteristics from the graphs of polynomial functions.	NEW UNIT for 2020-2021
			Analyzing and Comparing Polynomial Functions	Interpreting Key Features of Graphs in Terms of Quantities	Students are provided graphs in context. They interpret the meaning of relative maximum and minimum points, y-intercepts, x-intercepts, and increasing and decreasing intervals.	NEW UNIT for 2020-2021
<b>2</b>	<b>Developing Structural Similarities</b>	Topic 1: Relating Factors and Zeros	Polynomial Multiplication and Division	Using a Factor Table to Multiply Polynomials	Students use factor tables to multiply polynomials. Students combine like terms.	COMBINED UNITS: The <i>Polynomial Operations</i> and <i>Solving Polynomials</i> units were combined to create the <i>Polynomial Multiplication and Division</i> unit.
			Solving Polynomial Inequalities	Solving Polynomial Inequalities	Students solve polynomial inequalities graphically. In all cases, they solve inequalities written as greater than or less than zero. The worked example demonstrates to separate the left hand side and right hand side of the inequality into two separate equations. From there, the equations are graphed, and students visually inspect where the graph lies above or below the x-axis. Initially, students select the regions of the graph that make the inequality true directly on the graph. After some practice, they must also select the intervals for x that are solutions to the inequality.	NEW LOCATION: Formerly in <i>Polynomial Models</i> unit. NEW UNIT for 2020-2021

**National HSMS Algebra 2**  
2020-2021 MATHia Enhancements



		Topic 3: Rational Functions	Introduction to Rational Functions	Introduction to Rational Functions	Students are given the definition of a rational function and use the definition to sort given functions as rational functions or not. They are then shown the graph of a rational function and introduced to horizontal and vertical asymptotes. Students use a function and its graph to describe the asymptotes. Next they determine asymptotes of rational functions using only the equation.	NEW UNIT NAME: Formerly, <i>Rational Functions</i>
				Modeling Rational Functions	Students solve rational equation problems using a worksheet format, with separate columns for the independent quantity, the numerator, the denominator, and the rational expressions. All questions have the independent quantity given.	RELOCATED WORKSPACE: Formerly in the <i>Rational Models</i> unit
				Rewriting Rational Expressions	Students simplify simple rational expressions.	NEW WORKSPACE NAME: Formerly, <i>Simplifying Rational Expressions</i> RELOCATED WORKSPACE: Formerly in the <i>Rational Expressions and Equations</i> unit
			Operations with Rational Expressions	Adding and Subtracting Rational Expressions	Students simplify sums and differences of rational expressions.	NEW UNIT NAME: The unit formerly entitled <i>Rational Expressions and Equations</i> was split into two units: <i>Operations with Rational Expressions</i> and <i>Solving Problems with Rational Equations</i> .

National HSMS Algebra 2  
2020-2021 MATHia Enhancements



			Solving Problems with Rational Equations	Solving Rational Equations that Result in Linear Equations	Students solve rational equations, and classify the solutions as valid or extraneous.	NEW UNIT for 2020-2021
			Solving Work, Mixture, Distance, and Cost Problems	Modeling Ratios as Rational Functions	Students solve rational equation problems using a worksheet format, with separate columns for the independent quantity, the numerator, the denominator, and the rational expressions. Questions have either the independent quantity or a dependent quantity given, with the Solver available to solve for independent quantities.	NEW UNIT NAME: Formerly, <i>Rational Models</i> NEW WORKSPACE LOCATION: Formerly in the <i>Introduction to Rational Functions</i> (formerly entitled <i>Rational Functions</i> ) unit.
3	<b>Inverting Functions</b>	Topic 1: Radical Functions	Inverses of Functions	Sketching Graphs of Inverses	Students enter the inverse coordinate pairs, plot them on a graph, and reason about the domain and range.	REORDERED CONTENT: The <b>Sketching Graphs of Inverses</b> and <b>Graphing Square Root Functions</b> workspaces were transposed.
			Rewriting Radical Expressions	Rewriting Radicals	Students simplify numerical radical expressions.	NEW UNIT NAME: Formerly <i>Rewriting and Operating with Radicals</i> Content from former unit <i>Radical Expressions with Variables</i> moved here.

**National HSMS Algebra 2**  
 2020-2021 MATHia Enhancements



		Topic 3: Exponential and Logarithmic Equations	Solve Logarithmic Equations	Solving Base 2 and Base 10 Equations	Students solve equations of the form $A \cdot B^x = C$ and $A \cdot \log_B(x) = C$ , where B is either 2 or 10.	NEW UNIT NAME: Formerly, <i>Solve Equations with Base 2, 10, or e</i>
		Topic 4: Applications of Growth Modeling	Finite Geometric Series	Introduction to Finite Geometric Series	Students review sequences and sort geometric sequences from all other types of sequences. Series are defined as the sum of the terms of a sequence, and finite and infinite series are defined as well. The focus for the remainder of the workspace is on finite geometric series. Students are introduced to summation notation. The formula to calculate the sum of a finite geometric series is developed using Euler's Method, simplified in words, and then provided formally. Students calculate sums of finite series when given a series or summation notation for a series. Students also solve problems in real-world contexts requiring the calculation of the sum of geometric series.	NEW UNIT NAME: Formerly, <i>Finite Geometric Solutions</i>

**National HSMS Algebra 2**  
 2020-2021 MATHia Enhancements



4	<b>Investigating Periodic Functions</b>	Topic 1: Trigonometric Relationships	Trigonometric Relationships	Understanding the Unit Circle	Students watch an animation demonstrating how to determine and use radian measures as distances around the unit circle. The animation shows how the sine and cosine functions are constructed, mapping radian measures as inputs to the outputs of the sine or cosine of a central angle measure on the unit circle. Students derive how to convert between radian measures and degree measures. Finally, students analyze the sine and cosine functions, as members of a family of periodic trigonometric functions. Students identify the amplitude, midline, and period of each function and use the period to evaluate each function for different radian measures.	NEW UNIT NAME: Formerly, <i>Graphs of Trigonometric Functions</i>
5	<b>Relating Data and Decisions</b>	Topic 1: Interpreting Data in Normal Distributions	Normal Distributions	Creating Relative Frequency Histograms	Given a data set in context, students construct a relative frequency histogram. Students are provided a table with intervals and their frequencies, and they calculate the relative frequency for each interval. They select a title and label the horizontal axis based on the description of the data, while the label for the vertical axis and scales for both axes are provided. They use a tool to set the height of each bin to indicate its relative frequency.	NEW Mastery Workspace for 2020-2021