Marietta City Schools

2023–2024 District Unit Planner

Honors Advanced Algebra: Concepts & Connections

Unit title	Unit 3: Radical Functions	**Unit duration (hours)**	*11 HOURS*

Mastering Content and Skills through INQUIRY (Establishing the purpose of the Unit): ***What will students learn?***

GA DoE Standards

Standards

AA.FGR.4: Explore and analyze structures and patterns for radical functions and use radical expressions, equations, and functions to model real-life phenomena.

AA.FGR.4.1 Rewrite radical expressions as expressions with rational exponents. Extend the properties of integer exponents to rational exponents.

Fundamentals

- In previous grades, students should have developed an understanding of the properties of integer exponents.
- Students should be able to convert back and forth between radical expressions and expressions with rational exponents.
- Students should be able to recognize that $\sqrt[x]{b^n} = \left(\sqrt[x]{b}\right)^n = b^{n/x}$
- Students will utilize the product rule, quotient rule, and power rule to work with expressions with rational exponents.

AA.FGR.4.2 Solve radical equations in one variable, and give examples showing how extraneous solutions may arise.

Fundamentals

- Students should be able to convert between radical expressions and expressions with rational exponents to solve equations.
- Students should understand how to use substitution to check answers to radical equations to ensure that solutions are not extraneous

Strategies and Methods

- Students should have opportunities to use technology and tools to solve radical equations by graphing.
- Students should have opportunities to use technology and tools to explore and solve radical equations to strengthen conceptual understanding.

Example

- Given the volume of a sphere, students could determine the radius of the sphere by writing an equation for the radius, r, and solving for r.

AA.FGR.4.3 Analyze and graph radical functions.

Fundamentals

- Students should be able to graph and identify key features of a radical function including: domain, range, and x and y-intercepts; roots, zeros, and solutions; intervals where the function is increasing, decreasing, positive, and/or negative; maximum and minimum values, including endpoint extrema; non-symmetry; end behavior.

• Students should be able to calculate the slope of average rate of change for a given interval, including the estimated rate of change.
• Students should be able to relate the key features of a model (i.e., graph, equation, table) to the real-world situation which the model represents.

AA.FGR.4.4 Create, interpret and solve radical equations with one unknown value and use them to solve problems that model real-world situations.

Fundamentals

• Students should be able to analyze and interpret radical equations presented in mathematical, applicable situations.
• Students should discuss the characteristics of radical functions in context, including domain and range, zeros, intercepts, and other relevant key features.
• Students should be able to solve problems that can be modeled by radical equations.

Strategies and Methods

• Students should have opportunities to use technology and tools to solve radical equations to strengthen conceptual understanding.
• Students should be encouraged to explore multiple solution pathways, which might include graphing with various tools, interpreting key features, and evaluating radical equations.

Example

• Students can create a radical equation using the distance formula, for which the distance and three of the four coordinate values are known, and one is unknown.

AA.FGR.4.5 Create, interpret, and solve radical equations in two or more variables to represent relationships between quantities.

Strategies and Methods

• Less time should be devoted to the mechanics of solving radical equations and more time should be devoted to building students' capacity for interpreting radical functions within context

Example

• Students can create and interpret problems involving radical equations in which two of the variables are unknown, such as problems involving velocity.

AA.MM.1: Apply mathematics to real-life situations; model real-life phenomena using mathematics.

AA.MM.1.1 Explain applicable, mathematical problems using a mathematical model.

Fundamentals

• Students should be provided with opportunities to learn mathematics in the context of culturally relevant problems.
• Mathematically applicable problems are problems presented in context where the context makes sense, realistically and mathematically, and allows for students to make decisions about how to solve the problem (i.e., model with mathematics).

AA.MM.1.2 Create mathematical models to explain phenomena that exist in the natural sciences, social sciences, liberal arts, fine and performing arts, and/or humanities contexts.

Fundamentals

• Mathematically proficient students should be able to use the content learned in this course to create a mathematical model to explain real-life phenomena.

AA.MM.1.3 Using abstract and quantitative reasoning, make decisions about information and data from a mathematical, applicable situation.

Fundamentals

• Students should be able to:
  o analyze functions, graphs, tables, and equations and make decisions about the real-life situations they describe based upon their understanding of mathematical functions.
  o analyze statistical results to decide the best course of action or approach to a problem.

Example

• Given a rectangle with length = (x – 2) and width = (2x + 3), a student could discover and articulate that the area = (x – 2)(2x + 3) = 2x2 – x – 6. From the student's understanding of parabolas, a student would know that the parabola that represents all possible areas of this rectangle opens upwards and that there is no maximum area possible for this rectangle.

AA.MM.1.4 Use various mathematical representations and structures to represent and solve real-life problems.

Fundamentals

• Students should be able to generate models, graphs, charts, and equations, to represent real-world phenomena in order to solve problems.
• Students should be provided opportunities to generate representations of real-world phenomena utilizing technology to show these phenomena and to solve problems.

Concepts/Skills to support mastery of standards

Vocabulary

Asymptote	Cube Root	Cube Root Function	End Behavior	Exponent	Extraneous Solutions
Index	Inverse	Irrational Number	Radical	Racial Expression	Radical Symbol ($\sqrt{\ }$)
Radicand	Rational Exponent	Root	Square Root	Square Root Function	

Notation $\sqrt{\ }$, $\sqrt[n]{\ }$

Essential Questions

How are rational exponents used to show equivalence in radical form?

How do we solve radical equations?

How can we use rational exponents and radical equations to model real-world scenarios?

What is an extraneous solution? When might an extraneous solution occur in a radical equation?

What are the specific characteristics of radical functions?

How can we graph radical functions to model real-life scenarios?

Assessment Tasks

List of common formative and summative assessments.

Formative Assessment(s):

HW quizzes,

Unit quizzes

TOTD

Summative Assessment(s):

Unit Assessment

Learning Experiences		
Objective or Content	**Learning Experiences**	**Personalized Learning and Differentiation**
AA.FGR.4: Explore and analyze structures and patterns for radical functions and use radical expressions, equations, and functions to model real-life phenomena. **AA.FGR.4.1** Rewrite radical expressions as expressions with rational exponents. Extend the properties of integer exponents to rational exponents. **AA.FGR.4.2** Solve radical equations in one variable, and give examples showing how extraneous solutions may arise. **AA.FGR.4.3** Analyze and graph radical functions. **AA.FGR.4.4** Create, interpret and solve radical equations with one unknown value and use them to solve problems that model real-world situations. **AA.MM.1** Apply mathematics to real-life situations; model real life phenomena using mathematics. **AA.MM.1.1** Explain applicable, mathematical problems using a mathematical model. **AA.MM.1.2** Create mathematical models to explain phenomena that exist in natural sciences, social sciences, liberal ars, fine and performing arts, and/or humanities context.	**That's Radical Dude** In this learning plan, students will explore graphing radical functions using tables and technology. Students will use a calculator to calculate values and some calculations will produce error messages On the calculator because the x-values are outside the domain. Students will be asked to complete the table of values for the radical function, find the domain and range, and graph the function. **Learning Goals:** ● I can complete a table of values for a radical function. ● I can state the domain and range of a radical function. ● I can graph radical functions to model real-life scenarios. ● I can understand that the radicand of a radical must be non-negative only if the index Is even	Self paced, self checking desmos activities embedded Collaborative group work

AA.MM.1.3 Using abstract and quantitative reasoning, make decisions about information and data from a mathematically applicable situation.		

Content Resources

Textbook Correlation: enVision A|G|A - Algebra 2

AA.FGR.4.1 - Lessons 5-1, 5-2
AA.FGR.4.2 - Lesson 5-1
AA.FGR.4.3 - Lessons 5-3, 5-4
AA.FGR.4.4 - Lessons 5-4, Topic 5-Mathematical Modeling in 3 Acts
AA.FGR.4.5 - Lessons 5-4, Topic 5-Mathematical Modeling in 3 Acts

Desmos

DeltaMath

Khan Academy