Unit 7: Rational and Radical Functions

Unit Length: 20 days

Domain: The Real Number System

- Cluster 1: Extend the properties of exponents to rational exponents.
- Cluster 2: Use properties of rational and irrational numbers.

Domain: Arithmetic with Polynomials and Rational Expressions

- Cluster 10: Understand the relationship between zeros and factors of polynomials.
- Cluster 11: Use polynomial identities to solve problems.
- Cluster 12: Rewrite rational expressions.

Domain: Reasoning with Equations and Inequalities

- Cluster 14: Understand solving equations as a process of reasoning and explain the reasoning.

Domain: Interpreting Functions

- Cluster 19: Interpret functions that arise in applications in terms of the context.
- Cluster 20: Analyze functions using different representations.

Domain: Building Functions

- Cluster 22: Build new functions from existing functions.

Standards:

- HSN.RN.A.1:
  - Explain how extending the properties of integer exponents to **rational exponents** provides an alternative notation for **radicals**.
  - For example: We define $5^{4/3}$ to be the cube root of 5^4 because we want $\left(5^{4/3}\right)^{3/4} = 5$ to hold.
- HSN.RN.A.2:
  - Rewrite expressions involving **radicals** and **rational exponents** using the **properties of exponents**.
- HSN.RN.B.4:
  - Simplify **radical expressions**; perform operations (multiply and divide) with **radical expressions**; **rationalize** denominators and/or numerators.
- HSA.APR.D.6:
  - Rewrite simple **rational expressions** in different forms.

- Note: Students should understand that this method of dividing polynomials can be used for any polynomial expression, but that **synthetic division** should only be used when the **divisor** is a first-degree polynomial. Students should also recognize that when using **synthetic division** with a first-degree polynomial divisor that has a **leading coefficient** other than one, (such as 3x + 1, where x = -1/3 is the "**synthetic divisor**" as in the example above), that the denominator of the "**synthetic divisor**" must be factored out of the **quotient** and multiplied by the **divisor** after the **synthetic division** has taken place.

- *HSA.REI.A.2:
  - Solve simple **rational** and **radical** equations in one variable, and give examples showing how **extraneous solutions** may arise.
  - For example: The area of a square equals 49 square inches. The length of the side is 7 inches. Although -7 is a solution to the equation, x2 = 49, -7 is an **extraneous solution**.
- *HSF.IF.B.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.
  - Note: Key features may include but not limited to: **intercepts**; intervals where the function is **increasing**, **decreasing**, **positive**, or **negative**; **relative maximums** and **minimums**; **symmetries**; **end behavior**; and periodicity.
- *HSF.IF.C.7:
  - Graph functions expressed algebraically and show key features of the graph, with and without technology: graph **polynomial functions**, identifying **zeros** when suitable factorizations are available, and showing **end behavior**.
- *HSF.BF.B.3:
  - Identify the effect on the graph of replacing f(x) by f(x) + k, kf(x), f(kx) and f(x + k) for specific values of k (k. a **constant** both positive and negative); find the value of k given the graphs of the transformed functions; Experiment with multiple **transformations** and illustrate an explanation of the effects on the graph with or without technology.
  - Note: Include recognizing **even** and **odd** functions from their graphs and algebraic expressions for them.

**Guaranteed Viable Curriculum.*
Vocabulary to Emphasize is highlighted in **bold** script.

Learning Goal	Notes	Bellwork/Exit	Practice
Students will apply the meaning of rational exponents as an extension of the properties of integer exponents and rewrite expressions involving radicals and rational exponents using the properties of exponents. **Students will multiply and divide rational expressions and be able to justify their answer.** **Students will add and subtract rational expressions and be able to justify their answer.**	Radical Properties and Rational Exponents Note. Multiply and Divide Rational Expressions Note. Add and Subtract Rational Expressions Note.	Pre-Assessment CFA 1: Simplify Rational Expressions with Key. Note to Teachers: CFA 1 is created with a Part 1 and 2. CFA 1: Simplify Rational Expressions with Key.	Worksheet 1: Radical Properties with Rational Exponents with Key. Worksheet 2: Radical Properties with Rational Exponents with Key. Worksheet 1: Multiply and Divide Rational Expressions with Key. Worksheet 2: Multiply and Divide Rational Expressions with Key. Worksheet 1: Add and Subtract Rational Expressions with Key. Worksheet 2: Add and Subtract Rational Expressions with Key.
Students will solve simple radical equations and identify extraneous solutions, if necessary. **Students will determine the number of solutions of rational equations and be able to justify their answer.**	Solving Radical Equations Note. Solving Rational Equations Note.	Pre-Assessment CFA 2: Solving Radical and Rational Equations with Key. Note to Teachers: CFA 2 is created with a Part 1 and 2. CFA2: Solving Radical and Rational Equations with Key.	Worksheet 1: Solving Radical Equations with Key. Worksheet 2: Solving Radical Equations with Key. Worksheet 1: Solving Rational Equations with Key. Worksheet 2: Solving Rational Equations with Key.

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Algebra 2 Curriculum

Learning Goal	Notes	Bellwork/Exit	Practice
Students will graph square and cubic root functions and be able to explain the relationship between the equation and the graph. **Students will graph rational functions and be able to describe them by using key features.** **Students will exhibit knowledge of rational functions and be able to describe them using key features of the rational function family.**	Graphing Square Root Functions With Transformation. Note. Graphing Cubic Root Functions with Transformation Note. Graphing Rational Functions with RATTEY Method. Graphing Simple Form Rational Functions Note. Note: Regular is only required to graph simple rational functions.	Bellwork: Graphing a Radical Function. Note to Teachers: Pre-Assessment and CFA 3 are created with a Part 1 and 2. Pre-Assessment CFA 3 Graphing Radical and Rational Functions with Key. CFA 3: Graphing Radical and Rational Functions (Regular Version) with Key. CFA 3: Graphing Radical and Rational Functions (PAP Version) with Key.	Worksheet: Graphing Square Root Functions with Key. Worksheet: Solving Radical Equations and Graphing Radical Functions from TPT with Key. Worksheet: Graphing Rational Functions with RATTEY. Worksheet 1: Graphing Simple Form Rational Functions with Key. Worksheet 2: Graphing Simple Form Rational Functions with Key. Task: Average Cost HSF.IF.B.4 with Teacher Commentary from IM.

Summative Test Rational and Radical Functions (Regular Version)

Summative Test Rational and Radical Functions (PAP Version)