Unit 5 Rational Functions

Content Area: **Mathematics**
Course(s):
Time Period: **Marking Period 3**
Length: **2-3 weeks**
Status: **Published**

Brief Summary of Unit

Students will discover that rational functions are different from polynomial functions due to their domains not being continuous. The main focus of this unit is on simplifying rational functions using all the factoring techniques previously discussed, then using the main four algebraic operations on rational functions. Students will extend these operations, when needed, for solving rational equations. Throughout the unit, students will notice excluded values form the domain, and how this effects their solutions especially when solving rational equations.

Revision Date: July 2024

Standards

9.2.12.CAP.3	Investigate how continuing education contributes to one's career and personal growth.
9.2.12.CAP.6	Identify transferable skills in career choices and design alternative career plans based on those skills.
L.KL.9–10.2.A	Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level.
A.APR.D.6	Rewrite simple rational expressions in different forms; write □(□)/□(□) in the form □(□) + □(□)/□(□), where □(□), □(□), □(□), and □(□) are polynomials with the degree of □(□) less than the degree of □(□), using inspection, long division, or, for the more complicated examples, a computer algebra system.
A.APR.D.7	Understand that rational expressions form a system analogous to the rational numbers, closed under addition, subtraction, multiplication, and division by a nonzero rational expression; add, subtract, multiply, and divide rational expressions.
A.CED.A.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.
A.CED.A.2	Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
A.REI.A.2	Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.
SL.PE.11–12.1.A	Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas.

Essential Questions

- What algebraic and graphical observations make rational functions unique?
- What real world interpretation does a limit have?

Enduring Understandings

- Add and subtract rational expressions.
- Find restrictions to the domain of a rational function.
- Multiply and divide rational expressions.
- Solve rational equations using a variety of methods.

Students Will Know

- Excluded values of a rational expression.
- How to add, subtract, multiply, and divide rational expressions.
- How to solve rational equations.

Students Will Be Skilled At

- Adding and subtracting rational expressions with like denominators.
- Adding and subtracting rational expressions with unlike denominators.
- Finding a common denominator for rational expressions.
- Identifying extraneous solutions of rational equations.
- Multiplying and dividing rational expressions.
- Simplifying a rational expression and identifying any excluded values.
- Solving rational equations by cross multiplying.
- Solving rational equations by using the least common denominator to eliminate the denominators.

Evidence/Performance Tasks

Assessments

- Formative: Daily assessments using examples from class notes, NJSLA test bank problems, and/or Albert/AP Classroom assessments
- Summative: Teacher-created assessments, NJSLA test bank problems, Big Ideas Math online platform problems, Albert/AP Classroom and/or Big Ideas Math unit assessments
- Benchmark: IXL or teacher created diagnostic assessments in addition to unit assessments from Big

Ideas Math

- Alternative Assessments: Student-centered activities such as scavenger hunts, various projects involving real world applications, and differentiated learning tasks in Khan Academy, DeltaMath, and IXL

- Answer essential questions
- Class discussion of daily topic
- Classwork and homework that assess the essential questions
- Provide alternative means of assessments for certain students
- Teacher Observation
- Tests and quizzes that assess the essential questions
- Written assignments that assess the essential questions that involves providing explanations

Learning Plan

The following list is meant to create a day-to-day plan. Teachers are encouraged to slow down or condense days as appropriate to the student population in the class. Assessment(s) should be given when appropriate.

- Introduce the rational function and give the graph. Point out that there is a vertical asymptote created by the denominator, meaning this function has a restriction. Encourage students to always find the restrictions of a rational expression before continuing with any computations. Then, remind students that they can use their factoring knowledge to breakdown the numerator and denominator of a rational expression. If there is the same quantity on both sides of the fraction, then it can be canceled to simplify the expression.
- When setting up multiplication, again encourage students to find the restrictions first. Then, factor the numerators and denominators, and cancel any like quantities. Rewrite the answer as a single rational expression. When setting up division, remind students that they MUST follow steps to fix presenting fractions inside a fraction. Students should suggest a skill referring to "same, change, reciprocal". Now, students may find the restrictions, factor, and simplify. Rewrite the answer as a single rational expression. (For both operations, it is left to the teacher's discretion if the quantities in the final answer should be combined to standard form or left in factored form.)
- Students will likely need additional time to practice all the skills needed for simplifying, multiplying, and dividing rational expressions.
- Begin by reminding students how to add/subtract simple fractions. Students should remember that the biggest key to these operations is having a common denominator. Apply this idea to rational expressions. Remind students that they should keep finding restrictions before looking to complete any computations. Focus this lesson on starting with common denominators, therefore students can continue to work on combining like terms and factoring to simplify the rational expression.
- Build up to examples with unlike denominators. Again, find restrictions before completing any computations. Students should find the least common denominator (LCD). Remember to first rewrite both numerators so that like terms can be combined. Once the numerators are combined, try to factor and simplify the rational expression.
- Students will likely need additional time to practice adding and subtracting rational expressions with and without like denominators.
- Combine dividing and adding/subtracting skills, introduce complex fractions. Ask students to determine when in the process they should state restrictions.
- Start solving by using basic proportions to introduce the concept, something students should have seen

in Algebra 1 and again in Geometry. Remind students that restrictions are found in the denominator and state what x CANNOT equal. Therefore, if one of the solutions is a restriction, then it cannot be true. Note to students that when solving, they may need to use factoring techniques that were discussed in the previous units.

- Expand solving to needing an LCD before solving using proportions. Again, students should be finding restrictions of the rational equation.
- Students will likely need additional time to practice solving rational equations.

Materials

Core instructional materials:Core Book List including Big Ideas Math Algebra 2 2022

Supplemental materials: Khan Academy, Edia, and DeltaMath

- District approved textbook
- Graphing utility (calculator or desmos.com)
- Khan Academy
- Teacher created activiites
- Teacher created notes

Suggested Strategies for Modifications

Possible accommodations/modification for Algebra 2