Unit 05 (Chpt 7) Rational Functions

Content Area: **Mathematics**
Course(s):
Time Period: **Marking Period 3**
Length: **3-4 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. Students will work with and re-write rational expressions using fraction techniques as well as solve rational equations. Students will look at the behavior of the graphs of rational functions including how the discontinuity of the domain is seen in the graph as well as discovering asymptotes as an introduction to the concept of limits.

Revised Date: June 2024

Standards

1	Developing Responsibility for Learning: Cultivating independence, self-reflection, and responsibility for one's own learning.
3	Valuing Evidence in Argumentation: Constructing viable claims and evaluating, defending, challenging, and qualifying the arguments of others.
4	Building Knowledge: Building strong content knowledge and connecting ideas across disciplines using a variety of text resources and media.
5	Leveraging Technology: Employing technology and digital media thoughtfully, strategically and capably to enhance reading, writing, speaking, listening, and language use.
F.BF.B.3	Identify the effect on the graph of replacing □(□) by □(□) + □, □ □(□), □(□□), and □(□ + □) for specific values of □(both positive and negative); find the value of □ given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology.
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.1	Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has

	a solution. Construct a viable argument to justify a solution method.
A.REI.A.2	Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.
F.IF.C.7.d	Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.

Essential Questions

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

Enduring Understandings

- Rational functions are not polynomials because their domains are not continuous.
- Rational functions can be manipuated using fraction techniques.
- The behavior of rational functions provides an introduction to the mathematical concept of a limit.

Students Will Know

- Students will be able to solve rational equations and recognize extraneous solutions.
- Students will know how to add, subtract, multiply and divide rational expressions.
- Students will know how to graph a rational function.

Students Will Be Skilled At

- Students will be skilled at adding and subtracting rational expressions with like denominators.
- Students will be skilled at adding and subtracting rational expressions with unlike denominators.
- Students will be skilled at dividing rational expressions.
- Students will be skilled at finding a common denominator for rational expressions.
- Students will be skilled at finding the asymptotes and discontinuities of a rational function from an equation.
- Students will be skilled at graphing rational functions.
- Students will be skilled at multiplying rational expressions.
- Students will be skilled at simplifying rational expressions and identifying any excluded values.
- Students will be skilled at solving proportions by cross multiplying.
- Students will be skilled at solving rational equations by using the least common denominator.

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

Unit 5 Rational Functions (Chapter 7) (2 weeks)

Depending on timing and schedule, Operations and Solving Rational Equations can be covered and assessed separately from Graphing.

Throughout this unit, students should recognize the values that are excluded; values that make the rational expression undefined. This leads to realizing extraneous solutions and values of discontinuity on a graph.

7.3: Simplifying, Multiplying and Dividing Rational Expressions (1 day)

- Factor and cancel common factors.
- Students often struggle with monomial terms.
- When dividing, discuss “factoring and flipping” in the same step

7.4: Adding and Subtracting Rational Expressions (2 day2)

- Begin with rational expressions that have common denominators.
- When subtracting, students should recognize that they are subtracting the entire numerator and must distribute the negative sign.
- Find common denominators by first writing each denominator in factored form.
- 2nd Day, additional practice and complex fractions.

7.5: Solving Rational Equations, Extraneous Solutions (1 Day)

- Review solving proportions by cross multiplying.
- Solve equations with more than 2 terms by multiplying through by the LCD to cancel all denominators.
- Students often struggle with determining the LCD. They may need to take two steps to cancel all denominators.

Practice Day/Review for Assessment

7.2: Graphing Rational Functions (2-3 days)

- Discuss the parent function 1/x and find points on this graph.
- Discuss discontinuous domains of rational expressions or equations; values excluded from solution sets and why. These values will be areas where the graph is discontinuous. The values are either vertical asymptotes or holes.
- Discuss how to find characteristics of the graphs of rational functions: x-intercept, y-intercept.
- Horizontal Asymptotes have three possibilities. Use a pneumonic device for students to remember them. Substitute a large value for x to see how it affects the graph. Discuss the fact that the graph could go through a horizontal asymptote around the origin; the asymptote is a value as x gets very large or very small.
- Students should create tables to find points on either side of a vertical asymptote.
- At teacher's discretion, students could take formal assessment or complete a project on this topic.

Materials

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

Supplemental materials: Khan Academy, Edia, and DeltaMath

- District approved textbook and ancillary materials.
- Graphing utility (calculator or desmos.com)
- Online materials such a as Khan Academy, Delta Math, Edia, Ed Puzzle
- Teacher created activiites
- Teacher created notes

Suggested Strategies for Modification

Suggested Strategies for Modification for Algebra 2/Intro to Trig CP