# *Unit 6- Rational Equations and Functions

Content Area: **Mathematics**
Course(s): **Algebra 2 CP**
Time Period: **Marking Period 3**
Length: **11 blocks**
Status: **Published**

## Transfer Skills

In this unit students will be introduced to rational functions. Students will continue work with creating equivalent expressions to identify different properties. Students will gain a basic understanding of a rational graph and use inverses to aid in finding Domain and Range.

### Instructional Notes

Teacher is encouraged to use this unit to continue work with factoring. Students should have a strong understanding of the graph of f(x) = 1/x and there will be a strong understanding of the graphing calculator to identify key characteristics of a rational function graph.

**BLUE = 9/10 Only****

**RED = 9/10 & 11/12**

## Enduring Understandings

Mastering a procedure is not the same as understanding the concept.

Simplified expressions are essential in being able to solve equations.

Domain affects graphing and solving of rational functions.

## Essential Questions

How do we decide which method is most appropriate when solving rational equations?

When are asymptotes used to graph rational functions?

## Content

**Vocabulary**

Rational Expressions

Rational Functions

Least Common Denominator

Asymptotes

Holes

Points of Discontinuity

End Behavior

Transformations

Inverse

Domain

Range

**Increasing Inverval

**Decreasing Interval

## Skills

**Rational Functions**

Rewrite simple rational expressions in different forms using inspection.

Multiply and divide rational expressions and identify extraneous solutions

**Add and subtract rational expressions and identify extraneous solutions

Find the inverse of a rational function and identify the domain and range for the function and its inverse.

Solve simple rational equations in one variable and use them to solve problems, justify each step in the process and the solution.

Show how extraneous solutions may arise when solving a rational equation.

Use the graphing calculator to graph rational functions using the table feature as well as identify key characteristics

**Identify increasing and decreasing intervals as well as write the end behavior in limit notation

## Resources

**NJGPA Practice Test**

https://nj.mypearsonsupport.com/practice-tests/njgpa-math/

**NJSLA Practice Test**

https://nj/mypearsonsupport.com/practice-tests/math/

**Teacher Resources by Standard**

www.illustrativemathematics.org

illuminations.nctm.org/

www.pbslearningmedia.org/

**Online Teaching Websites**

www.khanacademy.org

www.ixl.com

**Algebra 2 Common Core Textbook**

Chapter 8 pg. 495

## Assessments

Quiz
Formative: Other Evidence: Other: Quiz
Simplifying Rational Expressions and Inverses

Unit Test
Summative: Transfer Tasks: Test: Common
Rational Expressions, Equations, and their Graphs

## Standards

**NJSLS 2016**

**Algebra**

**Arithmetic with Polynomials and Rational Expressions**

**A -APR D. Rewrite rational expressions**

6. Rewrite simple rational expressions in different forms; write a(x)/b(x) in the form q(x) + r(x)/b(x), where a(x), b(x), q(x), and r(x) are polynomials with the degree of r(x) less than the degree of b(x), using inspection, long division, or, for the more complicated examples, a computer algebra system.

**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

**Creating Equations**

**A -CED A. Create equations that describe numbers or relationships**

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.

**Reasoning with Equations and Inequalities**

**A -REI A. Understand solving equations as a process of reasoning and explain the reasoning**

2. Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.

**Functions**

**Building Functions**

**F-BF B. Build new functions from existing functions**

4. Find inverse functions.

**Mathematical Practices**

**1 Make sense of problems and persevere in solving them.**

Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, “Does this make sense?” They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

**5 Use appropriate tools strategically.**

Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the

results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.

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|---|---|
| MA.K-12.1 | Make sense of problems and persevere in solving them. |
| | Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, “Does this make sense?” They can understand the approaches of others to solving complex problems and identify correspondences between different approaches. |
| MA.F-IF.B | Interpret functions that arise in applications in terms of the context |
| MA.K-12.5 | Use appropriate tools strategically. |
| | Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts. |
| | For example, if the function $h(n)$ gives the number of person-hours it takes to assemble $n$ engines in a factory, then the positive integers would be an appropriate domain for the function. |
| MA.F-BF | Building Functions |
| MA.A-APR.D | Rewrite rational expressions |
| MA.A-APR.D.6 | Rewrite simple rational expressions in different forms; write $a(x)/b(x)$ in the form $q(x)$ + $r(x)/b(x)$, where $a(x)$, $b(x)$, $q(x)$, and $r(x)$ are polynomials with the degree of $r(x)$ less than the degree of $b(x)$, using inspection, long division, or, for the more complicated examples, a computer algebra system. |
| MA.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. |
| MA.A-CED | Creating Equations |

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| MA.A-CED.A | Create equations that describe numbers or relationships |
| MA.A-CED.A.1 | Create equations and inequalities in one variable and use them to solve problems. |
| MA.F-BF.B | Build new functions from existing functions |
| MA.F-BF.B.4 | Find inverse functions. |
| MA.A-REI | Reasoning with Equations and Inequalities |
| MA.A-REI.A | Understand solving equations as a process of reasoning and explain the reasoning |
| MA.A-REI.A.2 | Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise. |