**Algebra 3-4**

**Chapter 8: Rational Functions**

Designer(s): OPS Secondary Math Department Grade Level: Algebra 3-4, 2013

Rational Functions

Unit Overview

Rational Functions help explain how surface tension allows some animals to tread across a pond’s surface.

How can you graph rational functions and solve rational equations? You will learn how in this chapter.

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| **Unit 8: Rational Functions** | | |
| **Essential Questions** | **Standard** | **Objectives**  F= Factual C=Conceptual D=Debatable |
| * 1. Are two quantities inversely proportional if an increase in one corresponds to a decrease in the other? | 12.3.1.d  12.3.3.g | * Students will identify inverse and direct variation functions (F) * Students will describe inverse and direct variation functions (C) |
| * 1. What kinds of asymptotes are possible for a rational function? | 12.3.1.b, d, e | * Students will graph asymptotes of rational functions (C) * Students will identify whether a rational function has an asymptote (F) * Students will differentiate between vertical, horizontal and oblique asymptotes (C) |
| * 1. Are a rational expression and its simplified form equivalent? | 12.3.3.j, k, l | * Students will define the domains of simplified rational expressions to make them equivalent to the originals (C) |

**Unit 8: Rational Functions**

**Critical Content and Skills:**

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| *Knowledge Statements*  Students will know…   1. **Vocabulary**: inverse variation, joint variation, combined variation, reciprocal function, rational function, continuous graph, discontinuous graph, point of discontinuity, rational expression, complex fraction, rational equation 2. Inverse Variation 3. Rational Functions and Their Graphs 4. Simplify, Add, Subtract, Multiply and Divide Rational Expressions 5. Solve Rational Equations | *Key Skill Statements*  Students will know how to…   1. Identify and write a model for direct and inverse variation 2. Graph a rational function by translating the parent graph 3. Graph a rational function by finding asymptotes, holes and intercepts 4. Simplify rational expressions 5. Multiply and divide rational expressions and state restrictions on the variables 6. Add and subtract rational expressions and state restrictions on the variables 7. Simplify complex fractions 8. Solve rational equations |

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| **Algebra 3-4**  **Unit 8 Rational Functions** | | | |
| **Advanced**  **Score 4.0** | In addition to the Proficient (3.0) performance, makes ***indepth*** inferences and extended applications of what was learned, including connections to other experiences. | | * Write a rational function given asymptotes, intercepts and/or holes * Apply rational functions to real-world situations |
|  | **Proficient +**  **Score 3.5** | In addition to the complex ideas and processes (Proficient 3.0) performance, ***partial success*** at in-depth inferences and extended applications of what was learned, including connections to other experiences. | |
| **Proficient**  **Score 3.0** | ***No major*** errors or omissions regarding any of the information and simple (Basic, 2.0) or complex processes (Proficient, 3.0) that was explicitly taught. | | * Write an equation to model joint variation * Apply combined variation * Sketch the graph of a rational function graph using translations and state the domain and range * Sketch the graph of a rational function using asymptotes, holes and intercepts and state the domain and range * Factor then simplify, multiply or divide rational expressions * Simplify complex fractions * Add or subtract rational expressions with unlike denominators * Solve rational equations |
|  | **Basic +**  **Score 2.5** | ***No major*** errors or omissions regarding any of the information and/or simpler details and processes (Basic, 2.0) and ***partial*** knowledge of the more complex ideas and processes (Proficient, 3.0) | |
| **Basic**  **Score 2.0** | ***No major*** errors or omissions regarding the simpler details and processes (Basic, 2.0), but ***major*** errors or omissions regarding the more complex ideas and processes (Proficient, 3.0). | | * Write an equation to model direct or inverse variation * Find the constant of variation given an ordered pair and the type of variation * Find the missing value given an *xy-* pair, the type of variation and another *x* or *y* * Sketch the graph of a rational function that has been stretched, shrunk or reflected but not translated * Identify asymptotes, holes and intercepts * Simplify, multiply or divide rational expressions in factored form * Add or subtract rational expressions with like denominators |
| **Below Basic**  **Score 1.0** | A ***partial*** understanding of ***some*** of the simpler details and processes (Basic, 2.0), but ***major*** errors or omissions regarding the more complex ideas and processes. | | |
| **Failing**  **Score 0** | ***No*** evidence or ***insufficient*** evidence of student learning. | | |

Algebra 3-4 Name

Pd Date

**Unit 8 Assessment**

1. Write a function that models each variation. (L2)

a) *y* varies inversely as *x* and *x* = –1 when *y* = 5. 1a)

b) *z* varies directly with *y* and inversely with *x* and *x* = 3, *y* = 12 when *z* = 2

1b)

2. A concrete supplier sells premixed concrete in 300-ft3 truckloads. The area *A* that the concrete will cover is inversely proportional to the depth *d* of the concrete.

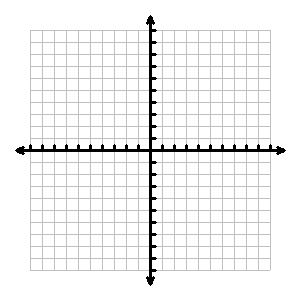
a)Write a model for the relationship between the area and the depth of a truckload of poured concrete. (L2)

2a)

b)What area will the concrete cover if it is poured to a depth of 0.5 ft? A depth of 1 ft? A depth of 1.5 ft? (L3)

2b) , ,

3. Describe how the variables in the given equation are related. (L4)

4. Identify vertical asymptotes, horizontal asymptote, x-intercept(s), y-intercept and domain and range. (L2) Then graph the rational function. (L3)

Vertical Asymptote

Horizontal Asymptote

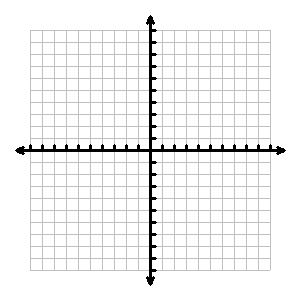
*x*-intercept(s)

*y*-intercept

Domain

Range

5. For the following rational functions, identify the holes, vertical asymptotes, horizontal asymptote and *x*- and *y-*intercepts. (L2) Graph the function and state the domain and range. (L3)



Hole(s)

Vertical Asymptote

Horizontal Asymptote

*x*-intercept(s)

*y*-intercept

Domain

Range

6. Write an equation for the translation of that has the following characteristics. (L4)

*x* – intercepts: *x* = 2, *x* = 0

Vertical Asymptote: *x* = -1, *x* = 4

Horizontal Asymptote: *y* = 2

7. Write a rational function that has a removable discontinuity (hole) in its graph at *x* = 3. (L4)

8. Simplify each expression.

a) (L2) b) (L2)

a) b)

c) (L3)

c)

10. Solve each equation. Check each solution.

a) (L3) b) (L3)

a) b)

c) (L3) d) (L4)

c) d)

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| **Learning Experiences** | **Text Pages/Resources** |
| **Vocabulary**   * Word wall * Foldable – See Glencoe @2010 Foldables by Dinah Zike for more information * Matching the word to the definition, graph, or example * Anticipation guide (pre and post) |  |
| * **Lesson Resources at the end of each section** * **Online Resources at pearsonsuccessnet.com** | Pearson  Algebra 2  Sections 8-1 through 8-6 |
| **General:**  **Test-Taking Strategy**  Be sure to check the reasonableness of your answer. If students are asked for the balance of a bank account where you were dealing with amounts in the hundreds, it is not reasonable to give an answer in the millions. To make sure the answer to a problem is reasonable, you can estimate before you calculate. If the answer is close to your estimate, your answer is probably correct. |  |

**Teacher Notes/Additional Resources**

**General Algebra & Math sites:**

* AlgebraLAB: Making Math & Science Connections [www.algebralab.org](http://www.algebralab.org)
* Classzone from Holt McDougall’s free site includes really cool animations. You and your students will simply need to figure out which chapter in their book relates to what we’re studying. <http://www.classzone.com/cz/books/algebra_1_2011_na/book_home.htm?state=NE>
* Kuta software <http://www.kutasoftware.com> Excellent free worksheets (with answers) <http://www.kutasoftware.com/free.html>
* NCTM’s Figure This! Web site has several challenge problems that are designed for families to do together. <http://figurethis.org/download.htm> These challenges (there are 80 of them!) could be used for daily warm-ups in class (several involve estimation), weekly Problem-of-the-Week, and even a challenge problem along with their homework, if relevant.
* Math is Fun! Includes an illustrated math dictionary and helpful tutorials for students. [www.mathisfun.com](http://www.mathisfun.com)
* Daily Math Review <http://www.aea11.k12.ia.us/E2T2/dmr.html>
* Great online timer: <http://www.online-stopwatch.com>
* Porta Portal’s consolidated resource list <http://guest.portaportal.com/mrburke>
* Algebra2Go <http://www.saddleback.edu/faculty/lperez/algebra2go/index.html>
* About.com Education site has great warm ups <http://712educators.about.com/cs/warmups/l/blwarmmath.htm>
* Southern Regional Education Boards Instructional Resources <http://www.evalutech.sreb.org/InstResources/index.asp>

**Books:**

* Various resources provided by publishers for the book selection process

**Videos:**

* BrainPop [www.brainpop.com](http://www.brainpop.com)
* Teacher Tube [www.teachertube.com](http://www.teachertube.com)