

Algebra 2 Honors Unit 6

Marking Period	Unit Title	Recommended Instructional Days
4	Rational Functions	15 - 18 days
Domain: Number and Quantity, Algebra, Functions		
<p>NJSLS Strand:</p> <p>Key:</p> <ul style="list-style-type: none"> ■ Major Cluster □ Supporting Cluster ○ Additional Cluster <p>■ N-RN.A.1 Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents.</p> <p>■ N-RN.A.2 Rewrite expressions involving radicals and rational exponents using the properties of exponents.</p> <p>■ N.RN.A.3 Simplify radicals, including algebraic radicals (e.g. , simplify).</p>	<p><i>Progress Indicator:</i> <i>Tests • Quizzes • Practice problems for homework • Online textbook • Worksheets • Leveled assessments</i></p>	<p style="text-align: center;">Recommended Activities, Investigations, Interdisciplinary Connections, and/or Student Experiences to Explore NJSLS-CLKS within Unit</p> <p><u>Essential Question/s:</u> What can the rule for a polynomial function reveal about its graph, and what can the graphs of polynomial functions reveal about the solutions of polynomial equations? How can vertical, horizontal, and slant asymptotes be determined from the equation of a rational function? From the graph?</p> <p><u>Activity Description:</u> Variation Functions Multiplying and Dividing Rational Functions Adding and Subtracting Rational Functions Graphing Rational Functions and Identifying Asymptotes</p> <p><u>Interdisciplinary Connections:</u> Science. Content: Concentration of drugs in the bloodstream ;NJSLS#:HS-LS1-3</p>

A-APR.A.1 Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials.

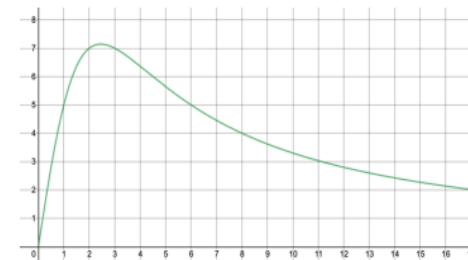
N-APR.D.6 Rewrite simple rational expressions in different forms; write $a(x)/b(x)$ in the form $q(x) + r(x)/b(x)$, where $a(x)$, $b(x)$, $q(x)$, and $r(x)$ are polynomials with the degree of $r(x)$ less than the degree of $b(x)$, using inspection, long division, or, for the more complicated examples,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

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

The concentration of anesthesia in a person's blood stream can be modeled by $C(t) = \frac{35t}{t^2+6}$ where C is given as a percent and t is in hours. A graph of C is shown below.

a. What do you notice about the graph? What do you wonder?



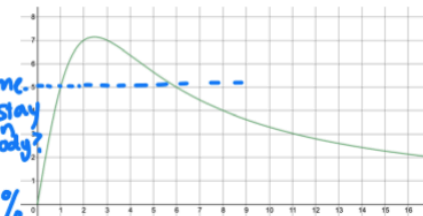
b. What is the concentration of anesthesia after a half hour?

c. What is the concentration of anesthesia after 24 hours? 48 hours?

Answer:

a. What do you notice about the graph? What do you wonder?

Notice: There is an initial spike + then a decrease over time.
Wonder: How long will it stay in body?



b. What is the concentration of anesthesia after a half hour?

$$C(0.5) = \frac{35(0.5)}{(0.5)^2 + 6} = 2.8\%$$

c. What is the concentration of anesthesia after 24 hours? 48 hours?

$$C(24) = \frac{35(24)}{(24)^2 + 6} \approx 1.44\% \quad C(48) = \frac{35(48)}{48^2 + 6} \approx 0.727$$

*Source: calc-medic.com

Example Tasks:

Task 1:

Graph the rational function

$$f(x) = \frac{x^2+x-6}{x^2-x-2}$$

Identify the domain, x- and y-intercepts, asymptotes and/or holes.

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-CED.A.3 Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. For example, represent inequalities describing nutritional and cost constraints on combinations of different foods. 🌱

■ **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

Answer:

Domain $(-\infty, -1) \cup (-1, 2) \cup (2, \infty)$

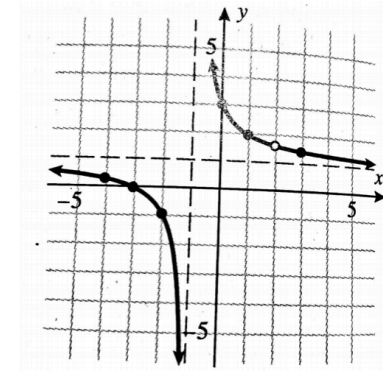
x-intercept $(-3, 0)$

y-intercept $(0, 3)$

Hole: $x = 2$

Vertical Asymptote: $x = -1$

Horizontal Asymptote: $y = 1$



Task 2:

Which of the following functions has a zero at $x = 3$ and has a graph in the xy -plane with a vertical asymptote at $x = 2$ and a hole at $x = 1$?

(A) $h(x) = \frac{x^2 - 4x + 3}{x^2 - 3x + 2}$

(B) $j(x) = \frac{x^2 - 5x + 6}{x^2 - 3x + 2}$

(C) $k(x) = \frac{x - 3}{x^2 - 3x + 2}$

(D) $m(x) = \frac{x - 3}{x^2 - 4x + 3}$

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.

■ **A-REI.D.11** Explain why the x-coordinates of the points where the graphs of the equations $y = f(x)$ and $y = g(x)$ intersect are the solutions of the equation $f(x) = g(x)$; find solutions approximately; e.g., using technology to graph functions, make tables of values, or find successive approximations. Include cases where $f(x)$ and/or $g(x)$ are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.*

A-REI.D.12 Graph the solutions to a linear inequality in two variables as a half-plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the

Answer: A

Task 3:

Perform the following operation. State the domain in interval notation.

$$\frac{3x - 4}{4x + 5} - \frac{5x + 3}{4x + 5}$$

Answer:

$$\frac{-2x - 7}{4x + 5}$$

$$\text{Domain: } \left(-\infty, -\frac{5}{4}\right) \cup \left(-\frac{5}{4}, \infty\right)$$

At the end of each topic please review the Assessment Practice and Performance Tasks questions.

Mixed Review Available Online



ASSESSMENT PRACTICE

33. Which function has a graph with a vertical asymptote at $x = 3$? Select all that apply.

Ⓐ $f(x) = \frac{x - 2}{x^2 + 2x - 15}$

Ⓑ $f(x) = \frac{x - 3}{x^2 + 7x + 12}$

Ⓒ $f(x) = \frac{x^2 - 9}{x + 9}$

Ⓓ $f(x) = \frac{x^2 + 6x + 5}{x^2 - 9}$

intersection of the corresponding half-planes.

F-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 in a verbal description of the relationship.

*Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.**

F-IF.B.5 Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph. ★ 🌱

F-IF.C.7 Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.

35. Performance Task There is a relationship between the degree of the numerator and denominator of a rational function and the function's horizontal asymptote.

Function	Horizontal Asymptote
$f(x) = \frac{2x}{x^2}$	
$f(x) = \frac{5x^2}{2x^3}$	
$f(x) = \frac{9x^6}{7x}$	
$f(x) = \frac{-3x^7}{4x^4}$	

Part A Complete the right column of the table.

Part B What is the relationship between the degree of the numerator and denominator when the horizontal asymptote is $y = 0$?

Part C What is the relationship between the degree of the numerator and denominator when there is no a horizontal asymptote?

Spot Light on: Amistad Law

<p>or table, given that the function has an inverse. d. (+) Produce an invertible function from a non-invertible function by restricting the domain.</p>		
Mathematics Practices		
<ol style="list-style-type: none"> 1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reason of others. 4. Model with mathematics. 5. Use appropriate tools strategically. 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning. 		
Social and Emotional Learning: <i>Competencies</i>	Social and Emotional Learning: <i>Sub-Competencies</i>	
<p>Self- awareness</p> <p>Social Awareness</p> <p>Self- Management</p> <p>Relationship Skills</p> <p>Responsible Decision-Making</p>	<p>Recognizing the importance of self-confidence in handling daily tasks and challenges.</p> <p>Demonstrate an awareness of the expectations for social interactions in a variety of ways.</p> <p>Demonstrate an understanding of the need for mutual respect when viewpoints differ.</p>	

	<p>Recognize the skills needed to establish and achieve personal and educational goals. Utilize positive communication and social skills to interact effectively with others. Develop, implement, and model effective problem solving and critical thinking skills.</p>		
<p>Assessments (Formative) <i>To show evidence of meeting the standard/s, students will successfully engage within:</i></p>		<p>Assessments (Summative) <i>To show evidence of meeting the standard/s, students will successfully complete:</i></p>	
<p><u>Formative Assessments:</u></p> <ul style="list-style-type: none"> • Entry and Exit Slips • Quizzes • Self Assessments 		<p><u>Benchmarks:</u></p> <ul style="list-style-type: none"> • Chapter Tests • Projects • LinkIT <p><u>Summative Assessments:</u></p> <ul style="list-style-type: none"> • District Assessments • Midterms • Standardized Tests 	
<p>Differentiated Student Access to Content: Teaching and Learning Resources/Materials</p>			
<p>Core Resources</p>	<p>Alternate Core Resources IEP/504/At-Risk/ESL</p>	<p>ELL Core Resources</p>	<p>Gifted & Talented Core Resources</p>
<ul style="list-style-type: none"> • Savvas Envision • Achieve the core • Khan Academy • Desmos 	<ul style="list-style-type: none"> • Skill building worksheets • Math Manipulatives 	<ul style="list-style-type: none"> • Dictionary for native languages • Videos in their native language. 	<ul style="list-style-type: none"> • Leveled Assessments • Enrichment worksheets
<p>Supplemental Resources</p>			

Technology: <ul style="list-style-type: none"> • Chromebooks, Graphing Calculators, Smartboards Other: <ul style="list-style-type: none"> • Zoom and Google Meets, Schoology,, Interactive Textbooks 			
Differentiated Student Access to Content: Recommended <i>Strategies & Techniques</i>			
Core Resources	Alternate Core Resources <i>IEP/504/At-Risk/ESL</i>	ELL Core Resources	Gifted & Talented Core
<ul style="list-style-type: none"> • Deliver instruction utilizing varied learning styles including audio, visual, and tactile/kinesthetic, provide individual instruction as needed, modify assessments and/or rubrics, repeat 	<ul style="list-style-type: none"> • Utilize a multi-sensory (VAKT) approach during instruction, provide alternate presentations of skills by varying the method (repetition, simple explanations, additional examples, modeling, etc.), modify test content and/or format, allow students to retake test for additional credit, provide additional times and preferential seating as needed, review, restate and repeat directions, provide study guides, and/or break assignments into segments of shorter tasks. 	<ul style="list-style-type: none"> • Extend time requirements, preferred seating, positive reinforcement, check often for understanding/review, oral/visual directions/prompts when necessary, supplemental materials including use of an online bilingual dictionary, and modified assessment and/or rubric. 	<ul style="list-style-type: none"> • Create an enhanced set of introductory activities, integrate active teaching/learning opportunities, incorporate authentic components, propose interest-based extension activities, and connect student to related
NJSLS CAREER READINESS,	Disciplinary Concept: Creativity and Innovation		
	Core Ideas:	Solutions to the problems faced by a global society require the contribution of individuals with different points of view and experiences	

LIFE LITERACIES & KEY SKILLS	Performance Expectation/s:	9.4.12.GCA.1: Collaborate with individuals to analyze a variety of potential solutions to climate change effects and determine why some solutions (e.g., political, economic, cultural) may work better than others (e.g., SL.11-12.1., HS-ETS1-1, HS-ETS1-2, HS-ETS1-4, 6.3.12.GeoGI.1, 7.1.IH.IPERS.6, 7.1.IL.IPERS.7, 8.2.12.ETW.3).
	Career Readiness, Life Literacies, & Key Skills Practices	
	<p>Act as a responsible and contributing community member and employee. Attend to financial well-being. Consider the environmental, social and economic impacts of decisions. Demonstrate creativity and innovation. Utilize critical thinking to make sense of problems and persevere in solving them. Model integrity, ethical leadership and effective management. Plan education and career paths aligned to personal goals. Use technology to enhance productivity, increase collaboration and communicate effectively. Work productively in teams while using cultural/global competence.</p>	

New Jersey Legislative Statutes and Administrative Code
(place an "X" before each law/statute if/when present within the curriculum map)

X	Amistad Law: <i>N.J.S.A. 18A 52:16A-88</i>		Holocaust Law: <i>N.J.S.A. 18A:35-28</i>		LGBT and Disabilities Law: <i>N.J.S.A. 18A:35-4.35</i>		Diversity & Inclusion: <i>N.J.S.A. 18A:35-4.36a</i>	X	Standards in Action: <i>Climate Change</i>
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