Intro to Algebra II

[Implement start year (2013-2014)]

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Unit #6 Rational and Radical Expressions and Equations

Stage 1 – Desired Results

Established Goals

2009 NJCCC Standard(s), Strand(s)/CPI #
(http://www.nj.gov/education/cccs/2009/final.htm)

Common Core Curriculum Standards for Math and English
(http://www.corestandards.org/)

Arithmetic with Polynomials and Rational Expressions A-APR: 1, 6, 7
- Perform arithmetic operations on polynomials.
- Rewrite rational expressions.

Reasoning with equations and inequalities A-REI: 1, 2
- Understand solving equations as a process of reasoning and explain the reasoning.

The Real Number System N-RN: 1, 2
- Extend the properties of exponents to rational exponents.

21st Century Themes
(**www.21stcenturyskills.org**)

___ Global Awareness
_X__Financial, Economic, Business and Entrepreneurial Literacy
___Civic Literacy
___Health Literacy
___Environmental Literacy

21st Century Skills

Learning and Innovation Skills:
_X__Creativity and Innovation
_X__Critical Thinking and Problem Solving
_X__Communication and Collaboration

Information, Media and Technology Skills:
___Information Literacy
___Media Literacy
_X__ICT (Information, Communications and Technology) Literacy

Life and Career Skills:
_X__Flexibility and Adaptability
_X__Initiative and Self-Direction
_X__Social and Cross-Cultural Skills
_X__Productivity and Accountability

	_X__Leadership and Responsibility

Enduring Understandings:	**Essential Questions:**
Students will understand that . . .	
EU 1	EU 1
• operations involving rational expressions are modeled to arithmetic operations containing fractions and solved utilizing algebraic equation solving techniques.	• What are the connections between rational expressions and fractional arithmetic? • What are the connections in solving rational equations and basic algebraic equations? • When and why is it important to fully factor the polynomials that make up the rational expressions?
EU 2	EU 2
• operations involving radicals are modeled to those of polynomials and rational expressions and solved utilizing algebraic equation solving techniques.	• What are the connections between operations with polynomials and radicals? • What are the connections between algebraic equations and radical equations? • Why does checking for a negative solution play such a vital role in solving radical equations? • When and why is it important to fully simplify a radical?

Knowledge: Students will know . . .	Skills: Students will be able to . . .
EU 1 • factoring techniques in order to fully factor polynomials. • simplifying techniques to reduce single fractions. • techniques to add, subtract, multiply, and divide fractions. • algebraic problem solving techniques to solve equations with rational expressions.	EU 1 • fully factor the polynomials that make up rational expressions. • reduce rational expressions congruent to single fractions. • add and subtract rational expressions by creating like denominators. • multiply rational expressions by cross reducing common factors • divide rational expressions by making use of reciprocals. • solve equations involving rational expressions.
EU 2 • techniques to represent a number inside a radical as the product of primes. • that perfect roots can be contained within imperfect roots. • that combining like terms is required when adding/subtracting polynomials. • the appropriate polynomial skills to perform addition and subtraction of radicals. • the appropriate use of the laws of exponents as they pertain to multiplication and division of like bases. • reducing techniques for single fractions and rational expressions. • the proper polynomial skills and laws of exponents to handle multiplication and division of radicals.	EU 2 • find the roots of radicals. • simplify numerical radicals and radicals with variable expressions. • add, subtract, multiply, and divide radicals and radical expressions. • rationalize denominators. • solve equations containing a single radical.

Stage 2 – Assessment Evidence

Recommended Performance Tasks: EU 1, EU 2

A company burns coal to generate electricity. The cost *C* (in dollars) of removing *p* amount (percent) of the smokestack pollutants is given by:

$$C = \frac{80,000p}{(100 - p)}$$

Part 1

Is it possible for the company to remove 100 percent of the pollutants? Explain why or why not, and support your response by using algebraic analysis. Include in your explanation if the company will be successful at doing so, or if the attempt will be too expensive for the company.

Part 2

Draw a diagram to show what the consequences of the last question would be. Label the vertical asymptote(s) and analyze their impact on the company's expense.

RESOURCES

Internet search engine
MS Word to draw diagram

Stage 3 – Learning Plan

Suggested Learning Activities to Include Differentiated Instruction and Interdisciplinary Connections: *Consider the WHERETO elements. Each learning activity listed must be accompanied by a learning goal of A= Acquiring basic knowledge and skills, M= Making meaning and/or a T= Transfer.*

Activities:
- Activity #1
  Students will solve a series of rational equations, including those with extraneous solutions.   (A)

- Activity #2
  Students will be given modeling problems of rational and radical expressions in which they must solve by simplifying, multiplying, and dividing while justifying each step of the solving. (M)

- Activity #3
  Students will be given modeling problems of rational and radical expressions involving like and unlike denominators which they must solve by addition and subtraction, justifying each step of the solution. (M)

- Activity #4
  Students will edit and correct work that purposefully includes mistakes; error analysis.   (M)

- Activity #5
  Students will brainstorm real-world applications where rational equations could be used to represent real-world situations such as knowing how much of a 25% alcohol solution you need to add to water to produce 1 liter of a 10% alcohol solution.   (M/T)

The following is the suggested sequence of learning activities for the Intro To Algebra II (level3) class and should comprise 23 school days:

- YWBAT simplify rational expressions. (A)
- YWBAT multiply and divide rational expressions. (A)
- YWBAT add and subtract rational expressions with like and unlike denominators. (A)
- Activity #3: Solving Rational Expressions with Like and Unlike Denominators. (M)
- YWBAT solve rational equations (including those with extraneous solutions). (A)
- Activity #1: Solving Rational Equations with Extraneous Solutions Included. (M/T)
- Activity #5: Brainstorming Real-World Applications. (M/T)
- YWBAT solve radical equations. (A)
- Activity #2: Justifying Each Step of a Solution (M)
- Activity #4: Error Analysis (M)