Radical Yet Rational, Part 3
Extraneous Solutions

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Grade Level	10th – 11th Grade	**Time Frame**	65-80 minutes
Subject	Mathematics	**Duration**	2 class periods
Course	Algebra 2		

Essential Question

How do we know if a solution is extraneous?

Summary

In this lesson, students will recall solving equations with rational exponents and radicals. Using graphs, students will recall evaluating and solving equations with function notation. Students then will learn how to address extraneous solutions and why they exist. Students will apply this new knowledge to mathematical problems.

Snapshot

Engage

Students recall solving equations using rational exponents and/or radicals.

Explore

Students use graphs to evaluate expressions and solve equations with function notation.

Explain

Students complete guided notes with the class and formalize their understanding of extraneous solutions.

Extend

Students apply what they have learned to solve mathematical problems.

Evaluate

Students reflect on their learning and decide what they found easiest and what they found most confusing about solving equations using rational exponents and/or radicals.

Standards

Oklahoma Academic Standards Mathematics (Algebra 2)

A2.N.1.3: Understand and apply the relationship between rational exponents to integer exponents and radicals to solve problems.

A2.A.1.5: Solve square and cube root equations with one variable, and check for extraneous solutions.

Attachments

- Exploring-Functions-Radical-Yet-Rational-Part-3 - Spanish.docx
- Exploring-Functions-Radical-Yet-Rational-Part-3 - Spanish.pdf
- Exploring-Functions-Radical-Yet-Rational-Part-3.docx
- Exploring-Functions-Radical-Yet-Rational-Part-3.pdf
- Guided-Notes-Radical-Yet-Rational-Part-3 - Spanish.docx
- Guided-Notes-Radical-Yet-Rational-Part-3 - Spanish.pdf
- Guided-Notes-Radical-Yet-Rational-Part-3.docx
- Guided-Notes-Radical-Yet-Rational-Part-3.pdf
- Guided-Notes-Teacher-Guide-and-Model-Notes-Radical-Yet-Rational-Part-3.pdf
- Lesson-Slides-Radical-Yet-Rational-Part-3.pptx
- Looking-for-Extraneous-Solutions-Radical-Yet-Rational-Part-3 - Spanish.docx
- Looking-for-Extraneous-Solutions-Radical-Yet-Rational-Part-3 - Spanish.pdf
- Looking-for-Extraneous-Solutions-Radical-Yet-Rational-Part-3.docx
- Looking-for-Extraneous-Solutions-Radical-Yet-Rational-Part-3.pdf

Materials

- Lesson Slides (attached)
- Exploring Functions handout (attached; one per pair; printed front only)
- Guided Notes handout (attached; one per student; printed front only)
- Guided Notes (Teacher Guide and Model Notes) (attached; for teacher use)
- Pencils
- Looking for Extraneous Solutions handout (optional; attached; one per student; printed front only)

5 minutes

Engage

As students enter the classroom, display **slide 3** from the attached **Lesson Slides**. To begin the lesson, ask students to answer the Bell Ringer questions on a piece of notebook paper or elsewhere if you have a classroom norm for bell work.

After giving students time to answer these questions, transition through **slides 4–5** so students can check their work. Use this time to address any misconceptions that remain from the previous lesson(s): "Radical Yet Rational, Part 2" and/or "Radical Yet Rational, Part 1."

Go to **slide 6** to share the lesson's essential question with students. Go to **slide 7** to identify the lesson's learning objectives. Review each of these with students to the extent you feel necessary.

5 minutes

Explore

Ask students to find partners or assign student pairs. Display **slide 8** and pass out the attached **Exploring Functions** handout to each pair of students.

Have students work with their partners to evaluate expressions and solve equations by using the provided graph. As students complete the handout, go to **slide 9** so students can check their work.

Teacher's Note: Purpose

During the Explain portion of the lesson, students are going to see both algebraic and graphical explanations for extraneous solutions. This activity is meant to help students transition their thinking from algebraic work to graphical explanations.

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30 minutes

Explain

Display **slide 10** and pass out the attached **Guided Notes** handout to each student. Complete the handout as a class. Have students add it to their math notebooks if that is a classroom norm.

Transition through **slides 11–13** to provide students with a graphical explanation of where extraneous solutions come from.

Teacher's Note: Guiding the Activity

The graphs on slides 11–13 show each side of the equation in the step before raising each side to a power. The blue curve/line is the left side of the equation, while the red curve/line is the right side of the equation. The green, dashed curve/line is the negative part of the given radical equation.

Alternatively, if students have the prerequisite knowledge of domain and range restrictions from having graphed square roots and cube roots, you could explain that an extraneous solution is an element of the domain restriction.

Teacher Guide and Model Notes

See the attached **Guided Notes (Teacher Guide and Model Notes)** document for more details regarding the graphs. This document also includes an example of how to fill out the Guided Notes handout.

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20 minutes

Extend

Teacher's Note: Preparation

Before beginning this activity, decide whether you want this portion of the lesson to be guided practice or independent practice.

The sample responses for this activity are included in the Lesson Slides, but they are hidden by default. If you would like students to check their work as they go, unhide slides 15–23 ahead of time. You can do so by right-clicking on each slide in the left-hand navigation panel and deselecting "Hide Slide" in the dropdown menu.

Optional Handout

Students can record their answers for this activity on a piece of notebook paper. Alternatively, you may choose to pass out the attached **Looking for Extraneous Solutions** handout to each student.

Inform students it is time for them to apply what they have learned. Display **slide 14** and have students work with their partners to solve the given equations with radicals and rational exponents and check for extraneous solutions.

Optional Slides

If you'd like, you may unhide and transition through **slides 15–23** so students can check their work. Ask for volunteers to explain their work for each question.

5 minutes

Evaluate

> **Teacher's Note: Preparation**
>
> Before beginning this activity, decide how you want students to record their Muddiest Point responses. For example, students could write their responses on notebook paper, sticky notes, index cards, etc.

Display **slide 24** and introduce the [Muddiest Point](#) strategy to help students reflect on the lesson and their overall understanding of the content. Use this strategy to determine students' confidence in solving equations with radicals and/or rational exponents.

After collecting students' responses, use their feedback to determine if remediation is needed or if students are ready for the next topic. If the class is split, consider remediation by grouping students who found something to be crystal clear with students who found that same thing to be most confusing.

Resources

- ElisaRiva. (February 13, 2017). Brain [Illustration]. Pixabay.https://pixabay.com/illustrations/brain-mind-psychology-idea-drawing-2062057/
- K20 Center. (n.d.). Bell Ringers and Exit Tickets. Strategies. https://learn.k20center.ou.edu/strategy/125
- K20 Center. (n.d.). Muddiest Point. Strategies. https://learn.k20center.ou.edu/strategy/109
- K20 Center. (n.d.). Desmos Classroom. Tech tools. https://learn.k20center.ou.edu/tech-tool/1081