Unit 3 Day 5

Solving Harder Radical Equations

Warm-Up

Solve for the missing variable:

1. $-8+\sqrt{5a-5}=-3$

a= 6

2. $10+\sqrt{10m-1}=13$

m= 1

3. $-12=-6\sqrt{b+4}$

b= 0

4. $-10\sqrt{v-10}=-60$

v= 46

Homework Answers

Packet Page 3 Continued…

I. Find the value of x in each of the following expressions.

$4^x \cdot 4^3 = 4^8$ x = 5	$(3^x)^{1/4} = 3$ x = 4	$4^{2/3} \cdot 4^x = 4$ x = 1/3
$(3^2)^x = 3^{14}$ x = 7	$(2^{-3})^x = \frac{1}{2^{12}}$ x = 4	$\frac{5^{2/3}}{5^x} = 5$ x = - 1/3
$\frac{4^3}{4^x} = 1$ x = 3	$\frac{3^x}{3^{12}} = \frac{1}{3^2}$ x = 10	$5^8 5^x = 1$ x = -8
$(3^x \cdot 7^5)^4 = 3^{20} 7^y$ x = 5 y = 20	$\left(\frac{3^7}{4^x}\right)^{-2} = \frac{4^{10}}{3^y}$ x = 5 y = 14	$(5^x 4^3)^2 = 4^y$ x = 0 y = 6

Homework Answers – Packet p.7

p. 7 Part 1

1. $x = 9$
2. $m = 81$
3. $x = 81$
4. $r = 49$
5. $x = 81$
6. $n = 25$

p. 7 Part 2

1. $n = 10$
2. $p = 1$
3. $x = 5$
4. $x = 0, 8$
5. $x = 6$
6. $r = 3$

Homework Answers – Finish Notes p. 8

Earlier in this unit, you learned that when written in radical form, it's only possible to write two multiplied radicals as one if the index is the same. However, if you convert the radical expressions into expressions with rational exponents, you CAN multiply or divide them (as you saw in your warm-up)! Give it a try ☺ Write your final answer as a simplified radical.

$$\frac{12\sqrt[3]{y}}{4\sqrt{y}} = \frac{12y^{1/3}}{4y^{1/2}} = 3y^{1/3-1/2} = 3y^{-1/6} = \frac{3}{y^{1/6}} \cdot \frac{\sqrt[6]{y^5}}{\sqrt[6]{y^5}} = \boxed{\frac{3\sqrt[6]{y^5}}{y}}$$

$$\left(\frac{\sqrt[3]{a^2}}{\sqrt{b}}\right)^{-6} = \left(\frac{a^{2/3}}{b^{1/2}}\right)^{-6} = \frac{a^{2/3\cdot -6}}{b^{1/2\cdot -6}} = \frac{a^{-4}}{b^{-3}} = \boxed{\frac{b^3}{a^4}}$$

if no fraction exponents, no radicals!

$$(2\sqrt[4]{a})^3 \cdot \sqrt{a^3} = (2^3)(\sqrt[4]{a})^3 \cdot \sqrt{a^3} = 8(\sqrt[4]{a^3})^3 \cdot (\sqrt{a})^3 = 8(a^{1/4})^3 \cdot (a^{1/2})^3$$

$$8a^{\frac{3}{4}}a^{\frac{3}{2}} = 8a^{\frac{9}{4}} = 8\sqrt[4]{a^9} = 8a^2\sqrt[4]{a}$$

$$\frac{\sqrt[4]{x^{12}} \cdot \sqrt{y^{-2}}}{\sqrt[3]{y}} = x^{12/4} \cdot y^{-2/2} \cdot y^{-1/3} = x^3 \cdot y^{-1} = \boxed{\frac{x^3}{y}}$$

Simplified with no fractions → no radical needed

$$\frac{\sqrt{64x^3}}{\sqrt[3]{512x^9}} = \frac{64^{1/2}x^{3/2}}{512^{1/3}x^{9/3}} = \frac{8x^{3/2}}{8x^3} = 1x^{3/2-3} = x^{-3/2} = \frac{1}{x^{3/2}} = \frac{1}{\sqrt{x^3}} = \boxed{\frac{1}{x\sqrt{x}}}$$

$$\sqrt[4]{625x^8} = (625)^{1/4}(x)^{8/4} = \boxed{5x^2}$$

$$\frac{\sqrt[7]{x^2} \cdot \sqrt[14]{x^3}}{\sqrt{x}} = x^{2/7} \cdot x^{3/14} = x^{\frac{4}{14}} \cdot x^{\frac{3}{14}} = x^{\frac{7}{14}} = x^{1/2} = \boxed{\sqrt{x}}$$

$$* \frac{1}{\sqrt[3]{-27x^9}} = \frac{1}{(-27)^{1/3}x^{9/3}} = \boxed{\frac{1}{-3x^3}}$$

* remember to watch for odd index and negatives under radical ... then you need a group of negatives

$$\left(\sqrt{x} \cdot \sqrt[3]{y^2}\right)^{-6} = (x^{1/2}y^{2/3})^{-6} = x^{1/2\cdot -6}y^{2/3\cdot -6} = x^{-6/2}y^{-12/3} = x^{-3}y^{-4} = \boxed{\frac{1}{x^3y^4}}$$

$\sqrt[3]{-27}$

$\sqrt[3]{-3\cdot -3\cdot -3}$

$= -3$

Tonight's Homework:

Homework
Packet p. 8 #1-12 & p. 9 ALL

STUDY FOR YOUR QUIZ TOMORROW
Hint: Bottom of Notes p. 14 – 15
could help you prepare for the quiz

Solving with Rational Exponents and Radicals Lesson

Today, we are going to come across some equations that have **no solutions** and some that have **two solutions**.

* Remember, you can **Always Check** your answers by substituting your solution into the equation to make sure it works *

Define: ***Extraneous Solution*** ~ is a root of a transformed equation that is ***not*** a root of the ***original equation*** because it was ***excluded from the domain*** of the original equation.

Aka ~ This solution occurs when we solve an equation correctly but the equation does not work when we check it.

Let's Solve For The Variable!!

1. $\sqrt{a+2} - 2 = a$

$x = -2, -1$

2. $\sqrt{3x - 2} = -5$

No Solution!

You Try! Solve For The Variable!!

3. $(2x+7)^{\frac{1}{2}} - x = 2$

$x = 1$

4. $3x^{4/3} + 5 = 53$

$x = 8$

$x = -8$

NOTE: When you put ¾ power, you are putting an even index into the problem, so you must put a +/- sign on it – just like you do when solving by square rooting.

Solving with Rational Exponents and Radicals

You're going to come across some tougher problems that involve multiple steps. Let's try a couple. ☺

1. $\sqrt{x-5}-\sqrt{x}=-2$

$x=\frac{81}{16}$

Solving with Rational Exponents and Radicals

You're going to come across some tougher problems that involve multiple steps. Let's try a couple. ☺

You Try!

2. $\sqrt{3x+7} = x - 1$

$x = 6$

Applications of Equations with Rational Exponents or Radicals.

1. The distance between two points is $5\sqrt{2}$. If one of the points is located at (4, 2) and the other point has a x-value of -1 , what are the possible y-values of the other point?

$$d = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$$

$$5\sqrt{2} = \sqrt{(4+1)^2 + (2 - y_2)^2}$$

$$50 = 25 + (2 - y)^2$$

$$50 = 25 + 4 - 4y + y^2$$

$$0 = y^2 - 4y - 21$$

$$0 = (y - 7)(y + 3)$$

$$y = 7, -3$$

Applications of Equations with Rational Exponents or Radicals. Continued…

2. The volume of a sphere is 2145. If the formula

$$V = \frac{4}{3}\pi r^3$$

is used to calculate the volume of a sphere, what is the radius of the sphere?

$$2145 = \frac{4}{3}\pi r^3$$

$$1608.75 = \pi r^3$$

$$512.08 = r^3$$

$$r \approx 8$$

Applications of Equations with Rational Exponents or Radicals. Continued…

3. The equation $V = \sqrt{2.5r}$ allows you to calculate the maximum velocity, v, that a car can safely travel around a curve with a radius of r feet. This is used by the Department of Transportation to determine the best speed limit for a given stretch of road. If a road has a speed limit of 45 mph, what is the tightest turn on that road?

r = 810 ft

Graphical Investigation

- Solve then Graph on your calculator to check solutions:

1. $\sqrt{x-1}=2$

2. $\sqrt{2x-1}+5=2$

3. $x-1=\sqrt{5x-9}$

4. What does a graph look like for equation that has an Extraneous Solution?

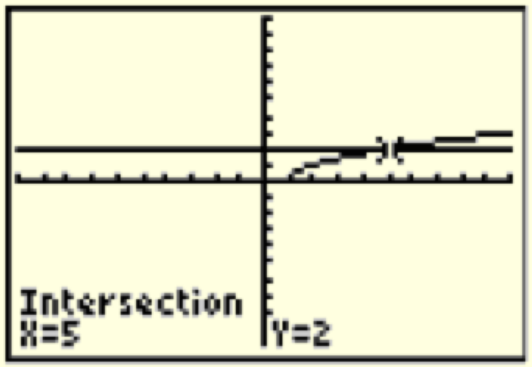
Graphical Investigation

- Solve then Graph on your calculator to check solutions:

1. $\sqrt{x-1}=2$

X=5

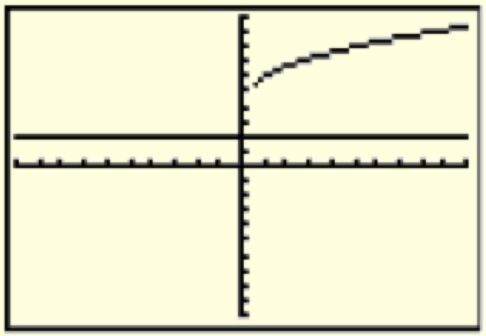
Graphical check:



2. $\sqrt{2x-1}+5=2$

No Solution

Graphical check:



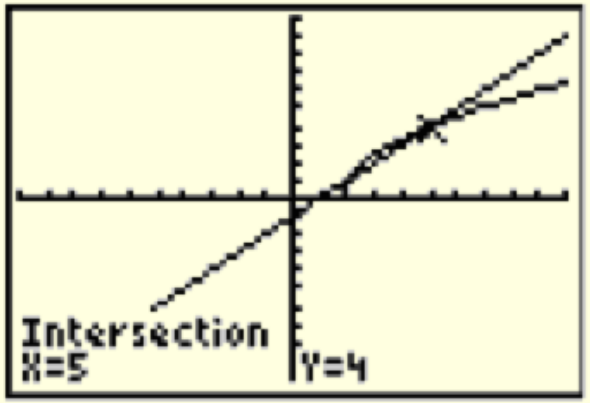
Graphs do not intersect.
No solution.

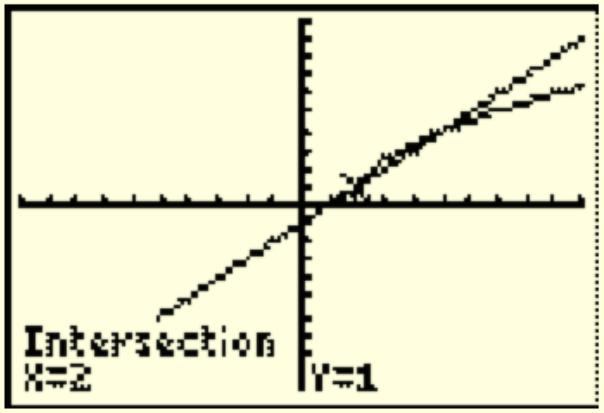
Graphing Investigation Continued..

3. $x - 1 = \sqrt{5x - 9}$

X=5, 2

Graphical check:





Graphing Investigation Continued..

4. What does a graph look like for equation that has an Extraneous Solution?

No Intersection at that x-value!

Extra Practice Handout
Puzzle

"What is the Advantage of Having Nuclear Physics?"

IT IS BETTER THAN THE OLD CLOUDY KIND

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