

Warm-up:

1) Evaluate the expression without using a calculator.  $(-27)^{-\frac{2}{3}}$

$$\rightarrow \frac{1}{(-27)^{\frac{2}{3}}} \Rightarrow \frac{1}{(-3)^2} \rightarrow \boxed{\frac{1}{9}}$$

2) Solve the equation:  $x^5 + 17 = 35$

$$\begin{aligned} & \quad \quad \quad -17 \quad -17 \\ & \quad \quad \quad \underline{\quad \quad \quad} \\ & \quad \quad \quad x^5 = 18 \\ & \quad \quad \quad \underline{\quad \quad \quad} \\ & \quad \quad \quad x = (18)^{\frac{1}{5}} = \underline{1.78} \end{aligned}$$

3) Simplify:  $4\sqrt[5]{8} - 3\sqrt[5]{8}$

$$\sqrt[5]{8}$$

**Agenda:**

- 1) Warm-up (check w/ elbow partner)
- 2) Homework Questions
- 3) New Lesson on 5.4 Solving Radical Equations (day 2)
- 4) In class Activity/Homework

## 5.4 Solving Radical Equations(day 2):

### Learning Targets:

- 1) Solve equations containing radicals and rational exponents

Def:

Equations with radicals that have variables in their radicands are called radical equations. Example:  $2\sqrt{x+1} = 4$

### Solving Radical Equations:

Step 1: isolate the radical (move all numbers outside the radical to the other side)

Step 2: Raise both sides to the correct power (to eliminate the radical)

Step 3: Solve the resulting equation

Example:

isolate  
the  
radical

$$\frac{2\sqrt{x+1}}{2} = \frac{4}{2}$$

$$(\sqrt{x+1})^2 = (2)^2$$

$$\begin{array}{r} x+1 = 4 \\ -1 \quad -1 \end{array}$$

$$\boxed{x=3}$$

Try:

$$\frac{\sqrt[3]{2x-9} - 1}{+1} = \frac{2}{+1}$$

$$\left(\sqrt[3]{2x-9}\right)^3 = (3)^3$$

$$\begin{array}{r} 2x-9 = 27 \\ +9 \quad +9 \end{array}$$

$$\frac{2x}{2} = \frac{36}{2}$$

$$\boxed{x=18}$$

Try:  $\frac{2\sqrt[3]{x-3}}{2} = \frac{4}{2}$

$$\left(\sqrt[3]{x-3}\right) = (2)^3$$

$$x-3 = 8$$

$$\begin{array}{r} +3 \quad +3 \\ \hline \end{array}$$

$$\boxed{x=11}$$

Try:  $\sqrt{2x+8} - 4 = 6$

$$\begin{array}{r} +4 \quad +4 \\ \hline \end{array}$$

$$\left(\sqrt{2x+8}\right) = (10)^2$$

$$2x+8 = 100$$

$$\begin{array}{r} -8 \quad -8 \\ \hline \end{array}$$

$$\frac{2x}{2} = \frac{92}{2}$$

$$\boxed{x=46}$$

Example:  $\frac{2x^2}{2} = \frac{250}{2}$

$$\left(x^{3/2}\right) = (125)^{2/3}$$

$$x^{6/6} = (5)^2$$

$$\boxed{x=25}$$

Try:  $(x+30)^{1/2} = x$  or  $\sqrt{x+30} = x$

$$\left((x+30)^{1/2}\right)^2 = (x)^2$$

$$x+30 = x^2$$

$$\begin{array}{r} -x \quad -30 \quad -x \quad -30 \\ \hline \end{array}$$

$$x^2 - x - 30 = 0$$

$$\begin{array}{r} 30 \cdot 1 \\ 15 \cdot 2 \\ \hline 10 \cdot 3 \\ \hline 6 \cdot 5 \end{array}$$

$$(x-6)(x+5) = 0$$

$$x-6=0 \quad x+5=0$$

$$x=6 \quad \boxed{x=-5}$$

Example: (2 radicals...isolate the "nasty" radical)

$$\sqrt{4x+1} = \sqrt{x+10}$$

$$\left(\sqrt{4x+1}\right)^2 = \left(\sqrt{x+10}\right)^2$$

$$\begin{array}{r} 4x+1 = x+10 \\ -x \quad -x \\ \hline \end{array}$$

$$\begin{array}{r} 3x+1 = 10 \\ -1 \quad -1 \\ \hline \end{array}$$

$$\begin{array}{r} 3x = 9 \\ \hline 3 \quad 3 \end{array}$$

$$\boxed{x=3}$$

Try:  $\sqrt[4]{3-8x^2} = 2x$

$$\left(\sqrt[4]{3-8x^2}\right)^4 = (2x)^4$$

$$3-8x^2 = 2^4 \cdot x^4$$

$$\begin{array}{r} 3-8x^2 = 16x^4 \\ -3 \quad +8x^2 \end{array}$$

$$\rightarrow \boxed{16x^4 + 8x^2 - 3 = 0}$$

$$\begin{array}{r} 48 \cdot 1 \\ 24 \cdot 2 \\ 16 \cdot 3 \\ \hline 12 \cdot 4 \\ 8 \cdot 6 \end{array}$$

$$\begin{array}{r} +8x^2 - 3 \\ \hline \end{array} \left( \frac{16x^4 + 12x^2}{4x^2} \right) \left( \frac{4x^2 - 3}{-1} \right) = 0$$

$$4x^2(4x^2+3) - 1(4x^2+3) = 0$$

$$(4x^2-1)(4x^2+3) = 0$$

$$4x^2-1=0$$

$$4x^2+3=0$$

$$4x^2 = 1$$

$$x^2 = 1/4$$

$$x = \pm \sqrt{1/4} = \pm 1/2$$

$$\begin{array}{r} 4x^2 = -3 \\ \hline 4 \quad 4 \\ \sqrt{x^2} = \sqrt{-3/4} \end{array}$$

imaginary

But only  
+ 1/2  
works!

\*Show... $x=5$  .... $x^2 = 25$ .... $x=5$  &  $-5$

When squaring both sides, we sometimes add extra solutions! We must plug our answers in to see if they work!

Example:

$$\begin{aligned}
 x + 1 &= \sqrt{7x + 15} \\
 (x+1)^2 &= (\sqrt{7x+15})^2 \\
 (x+1)(x+1) &= 7x+15 \\
 x^2 + 2x + 1 &= 7x + 15 \\
 \begin{array}{r}
 x^2 + 2x + 1 \\
 -7x - 15 \\
 \hline
 x^2 - 5x - 14 = 0
 \end{array} & \quad \begin{array}{l} 14 \cdot 1 \\ 7 \cdot 2 \end{array} \\
 (x-7)(x+2) &= 0 \\
 (x-7) &= 0 \quad x+2=0 \\
 x=7 & \quad x=-2
 \end{aligned}$$

$$\begin{aligned}
 7+1 &= \sqrt{7(7)+15} & -2+1 &= \sqrt{7(-2)+15} \\
 8 &= \sqrt{49+15} & -1 &= \sqrt{-14+15} \\
 8 &= \sqrt{64} & -1 &= \sqrt{1} \\
 8 &= 8 & -1 &= 1 \text{ nope}
 \end{aligned}$$

only 7 works

Try:

$$\begin{aligned}
 \sqrt{2x+7} &= x-4 & (x-4)(x-4) \\
 (\sqrt{2x+7})^2 &= (x-4)^2 & x^2 - 8x + 16 \\
 \begin{array}{r}
 2x+7 \\
 -2x-7 \\
 \hline
 x^2 - 8x + 16 \\
 -2x-7 \\
 \hline
 x^2 - 10x + 9 = 0
 \end{array} & \quad x=9 & \begin{array}{r}
 \sqrt{18+7} = 9-4 \\
 \sqrt{25} = 5 \\
 5 = 5 \checkmark
 \end{array} & \begin{array}{r}
 \sqrt{2+7} = 1-4 \\
 \sqrt{9} = -3 \\
 3 = -3 \text{ nope}
 \end{array} \\
 (x-9)(x-1) &= 0 \\
 \boxed{x=9} & \quad x=1
 \end{aligned}$$

\*Activity (if time)

Homework: pg 266 (3-7, 15-18, 21-23, 27, 28, 30, 31) or wks 5.4b