

You will need

- Calculator
- White Practice Sheet from yesterday.

Let's talk about...

On front:

 $\sqrt{\quad} = \text{Neg \#}$ 

$$12) \sqrt{5x-1} + 8 = 2$$

$$\quad \quad \quad -8 \quad -8$$

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$$\sqrt{5x-1} = -6$$

NO SOL.

On back:

 $(x+2)(x+2)$ 

$$22) (\sqrt{x+2})^2 = (x+2)^2$$

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


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

$$(x+1)(x+2) = 0$$

 $(x+5)(x+5)$ 

$$25) (\sqrt{3x+13})^2 = (x+5)^2$$

$$\begin{array}{l} x = -1 \\ x = -2 \end{array}$$

$$\begin{array}{r} 3x+13 = x^2 + 10x + 25 \\ -3x-13 \quad \quad -3x-13 \end{array}$$


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$$0 = x^2 + 7x + 12$$

$$0 = (x+4)(x+3)$$

$$x = -4, -3$$

## Solving Equations with Rational Exponents

Remember that radical expressions can be represented with rational/fractional exponents (and vice versa).

Examples:  $\sqrt{x} = x^{\frac{1}{2}}$

$\sqrt[3]{x^2} = x^{\frac{2}{3}}$

$8^{1/3} = \sqrt[3]{8}$

Now we will work on solving equations containing fractional exponents within them.

- 1) Isolate the power
- 2) Raise both sides to the reciprocal power to cancel.
- 3) Solve
- 4) Check your answer

Reviewing reciprocals is necessary before we start. If one side of the equation is raised to a certain fractional power, raising both sides to the reciprocal power will 'unlock' that side.

Examples:  $\frac{1}{2}$  reciprocal  $\rightarrow 2$

$\frac{2}{3}$  reciprocal  $\rightarrow \frac{3}{2}$

$\frac{4}{3}$  reciprocal  $\rightarrow \frac{3}{4}$

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Example 1:

$$\begin{aligned} (3x-1)^{\frac{1}{2}} &= (2x+5)^{\frac{1}{2}} \\ 3x-1 &= 2x+5 \\ -2x &\quad -2x \\ \hline x-1 &= 5 \\ \boxed{x=6} \end{aligned}$$

Example 2:

$$\begin{aligned} 2(5x-1)^{\frac{1}{2}} - 2 &= 0 \\ +2 \quad +2 \\ \hline 2(5x-1)^{\frac{1}{2}} &= 2 \\ \frac{2}{2} &\quad \frac{2}{2} \\ (5x-1)^{\frac{1}{2}} &= 1 \\ (5x-1)^{\frac{1}{2} \cdot 2} &= (1)^2 \\ 5x-1 &= 1 \end{aligned}$$

Example 3:

$$\begin{aligned} (3x+2)^{\frac{1}{3}} + 1 &= 0 \\ -1 \quad -1 \\ \hline (3x+2)^{\frac{1}{3}} &= -1 \\ ((3x+2)^{\frac{1}{3}})^3 &= (-1)^3 \\ 3x+2 &= -1 \\ -2 \quad -2 \\ \hline 3x &= -3 \\ x &= -1 \end{aligned}$$

Example D:

$$(3x+1)^{\frac{1}{3}} = -5$$

Example E:

$$\begin{aligned} 3(2x+6)^{\frac{1}{4}} - 6 &= 0 \\ +6 \quad +6 \\ \hline 3(2x+6)^{\frac{1}{4}} &= 6 \\ \frac{3}{3} &\quad \frac{3}{3} \\ (2x+6)^{\frac{1}{4}} &= 2 \\ ((2x+6)^{\frac{1}{4}})^4 &= (2)^4 \\ 2x+6 &= 16 \\ -6 \quad -6 \\ \hline 2x &= 10 \\ \boxed{x=5} \end{aligned}$$

$$\begin{aligned} x &= \frac{2}{5} \\ \boxed{x = \frac{2}{5}} \\ \text{or} \\ x &= -4 \end{aligned}$$

$$\begin{aligned} 3x &= -3 \\ x &= -1 \end{aligned}$$

Almost got it! But here are some problems where the fractional power does not have a numerator of 1.

Use the reciprocal still.

$$\sqrt[3]{8^5} = 8^{5/3}$$

$$\sqrt[2]{9^3} = 9^{3/2}$$

<p><b>Example F:</b></p> $4x^{3/2} - 8 = 0$ $\begin{array}{r} 18 + 8 \\ \hline 4x^{3/2} = 8 \\ \hline \frac{4x^{3/2}}{4} = \frac{8}{4} \\ x^{3/2} = 2 \\ (x^{3/2})^{2/3} = (2)^{2/3} \\ x = 1.58 \end{array}$	<p><b>Example G:</b></p> $(x-1)^{2/3} = 64^{3/2}$ $\begin{array}{r} x-1 = 512 \\ +1 \quad +1 \\ \hline x = 513 \end{array}$	<p><b>Example H:</b></p> $4(3x+5)^{2/3} = 100$ $\begin{array}{r} \frac{4(3x+5)^{2/3}}{4} = \frac{100}{4} \\ (3x+5)^{2/3} = 25 \\ \frac{3x+5}{-5} = \frac{125}{-5} \\ 3x = 120 \\ \boxed{x = 40} \end{array}$	<p><b>Example I:</b></p> $3(x+2)^{3/4} + 6 = 30$ $\begin{array}{r} -6 \quad -6 \\ \hline 3(x+2)^{3/4} = 24 \\ \frac{3(x+2)^{3/4}}{3} = \frac{24}{3} \\ (x+2)^{3/4} = 8 \\ (x+2)^{3/4 \cdot 4/3} = (8)^{4/3} \\ x+2 = 16 \\ -2 \quad -2 \\ \hline \boxed{x = 14} \end{array}$
$2 \times \boxed{\frac{2}{3}}$		$64 \times \boxed{\frac{3}{2}}$	

EVENS OR ODDS ☺