3-3 Solving Radical Equations

Objectives: $\sqrt{\ }$ $\sqrt[3]{\ }$ $\sqrt[4]{\ }$ $\sqrt[5]{\ }$

3-3a: I can solve radical equations.

Mar 12-4:34 PM

Solving Radical Equations

Graphically: Graph the two sides of the equation as separate functions, then see where they intersect. (where they cross)

Algebraically: Get x by itself using algebra.

Extraneous Solutions: Answers you get from solving algebraically that don't work when plugged into the equation.

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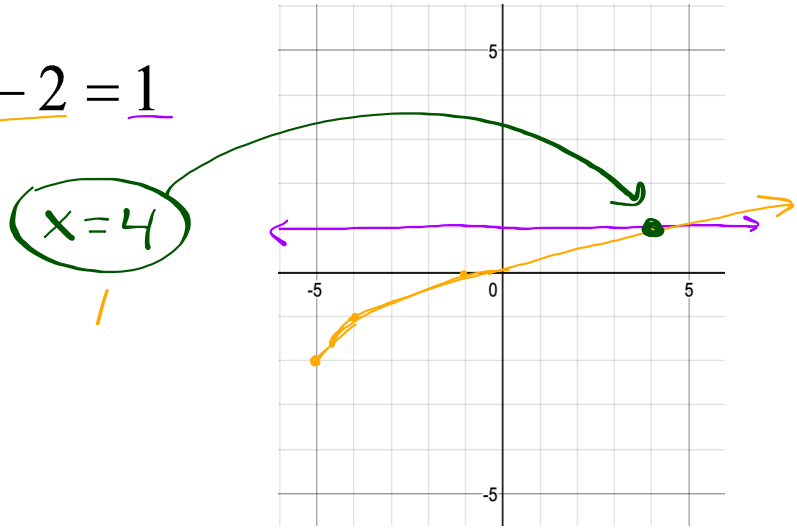
Find the solution graphically

$$(x+5)^{\frac{1}{2}} - 2 = 1$$



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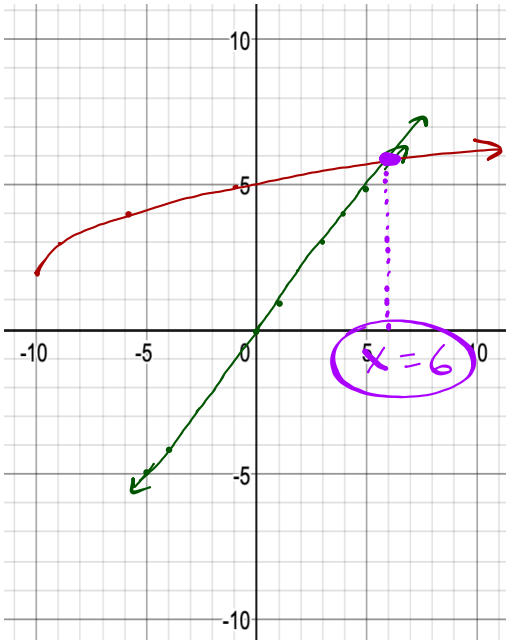
Find the solution graphically.

$$2 + \sqrt{x+10} = x$$



Solve the following algebraically. Check for extraneous solutions.

$$\sqrt{2x+5}+4=3$$

$-4 \quad -4$

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

$2x+5=1$

$2x=-4$

$x=-2$ Extraneous

No Solution

PEMDAS

$5 \neq 3$

$(-1)^2=1$

$-1^2=-1$

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$$2\sqrt{x-1}+1=9$$

$-1 \quad -1$

$\frac{2\sqrt{x-1}}{2}=\frac{8}{2}$

$(\sqrt{x-1})^2=(4)^2$

$x-1=16$

$x=17$

$9=9$ ✓

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

$$x + 9 = 27$$

$$x = 18$$

Solve the following algebraically. Check for extraneous solutions.

$$\left(\sqrt{5x-11}\right)^2 = (x-1)^2$$

$(x-1)(x-1)$

$x^2 - x - x + 1$

$x^2 - 2x + 1$

$5x - 11 = x^2 - 2x + 1$

$-5x + 11 \qquad -5x + 11$

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

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

12: $4 \cdot 3$, $-4 \cdot -3$

$x - 4 = 0 \qquad x - 3 = 0$

$x = 4 \qquad x = 3$

Check solutions!

$$\sqrt{5x-11} = x - 1$$

$\sqrt{9} = 3$

$3 = 3$ ✓

$$\sqrt{5x-11} = x - 1$$

$\sqrt{4} = 2$

$2 = 2$ ✓

Solve.

$x^{\frac{1}{2}} = \sqrt{x}$ $x^{\frac{1}{3}} = \sqrt[3]{x}$

$\sqrt[3]{x+2}+7=5$

$-7 \quad -7$

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

$x+2 = -8$

$-2 \quad -2$

$x = -10$

$2(x-50)^{\frac{1}{3}} = -10$

$\frac{2}{2} \quad \frac{-10}{2}$

$((x-50)^{\frac{1}{3}})^3 = (-5)^3$

$x-50 = -125$

$x = -75$

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Solve the following:

$(\sqrt[3]{x-5})^3 = (\sqrt[3]{7-x})^3$

$x-5 = 7-x$

$+x \quad +5 \quad +5 \quad +x$

$2x = 12$

$\frac{2x}{2} = \frac{12}{2}$

$x = 6$

$(\sqrt[3]{x+2})^3 = (\sqrt[3]{x+3})^3$

$x+2 = x+3$

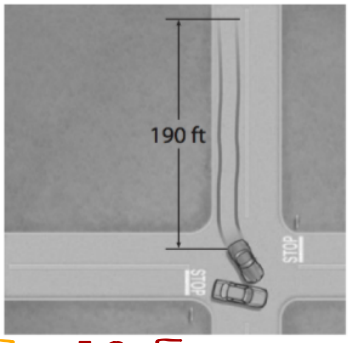
$-x \quad -2 \quad -x \quad -2$

Not true $\rightarrow$ $0 = 1$

so No Solution!

Mar 16-7:52 AM

Driving The speed s in miles per hour that a car is traveling when it goes into a skid can be estimated by using the formula $s = \sqrt{30fd}$, where f is the coefficient of friction and d is the length of the skid marks in feet.



After an accident, a driver claims to have been traveling the speed limit of 55 mi/h. The coefficient of friction under the conditions at the time of the accident was 0.6, and the length of the skid marks is 190 feet. Is the driver telling the truth about the car's speed? Explain.

$55 = \sqrt{30(0.6)(190)} \rightarrow 55 = 58.5$

Not true. Liar!!!

Use the formula to find the length of a skid at a speed of 55 mi/h. Compare this distance to the actual skid length of 190 feet.

$(55)^2 = (\sqrt{30(0.6)d})^2$

$\frac{3025}{18} = \frac{18d}{18}$

$d = 168.1$ ft

± 22 feet different

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Your Turn

9. **Biology** The trunk length (in inches) of a male elephant can be modeled by $l = 23\sqrt[3]{t} + 17$, where t is the age of the elephant in years. If a male elephant has a trunk length of 100 inches, about what is his age?

$100 = 23\sqrt[3]{t}$ $+17$ -17

$\frac{83}{23} = \frac{23\sqrt[3]{t}}{23}$

$3.61 = \sqrt[3]{t}$

$t = 1.53$ yrs

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