6-5: Solving Square Root and Other Radical Equations

Algebra 2

Mr. Gallo

Solving a Square Root Equation

What is the solution of $\sqrt{x+4}+6=7$?

$$\sqrt{x+4}+6=7$$

$$\sqrt{x+4}=1$$ ← Isolate the Radical Expression

$$\left(\sqrt{x+4}\right)^2=(1)^2$$ ← Square Each Side

$$x+4=1$$ ← Subtract 4 from each side

$$x=-3$$

Squaring can introduce **extraneous solutions**. Check your answers.

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Solving Equations with Radicals

To solve an equation with a single rational power: raise **both** sides of the equation to the **power of the reciprocal** of that exponent.

What is the solution of $x^{\frac{3}{2}}$ and $(6x+9)^{\frac{1}{3}} - 5 = -2$?

$$x^{\frac{3}{2}} = 5$$

$$\left(x^{\frac{3}{2}}\right)^{\frac{2}{3}} = 5^{\frac{2}{3}}$$

$$x = \sqrt[3]{5^2} = \sqrt[3]{25}$$

$$x \approx 2.92$$

Remember to check for extraneous solutions

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$$(6x+9)^{\frac{1}{3}} - 5 = -2$$

$$\left((6x+9)^{\frac{1}{3}}\right)^{\frac{3}{1}} = 3^{\frac{3}{1}}$$

$$6x+9 = 27$$

$$6x = 18$$

$$x = 3$$

The time (in t seconds) that it takes a pendulum to complete one full swing is given by the formula :

$$t = 2\pi\sqrt{\frac{L}{g}}$$

where ***L*** is the length of the arm of the pendulum (in cm.), and ***g*** is the acceleration due to gravity.

Suppose a ball on a string, swinging like a pendulum, takes 2 seconds to complete one swing back and forth. If g = 980 cm/sec², find the length of the string.

Substitute the given values and solve for L.

Solution on the next slide.

$t = 2\ sec$
$g = 980\ cm/sec^2$
Find **L**, the length of string.

$$t = 2\pi\sqrt{\frac{L}{g}}$$

$$2 = 2\pi\sqrt{\frac{L}{980}}$$

$$\frac{2}{2\pi} = \sqrt{\frac{L}{980}}$$

$$\left(\frac{1}{\pi}\right)^2 = \frac{L}{980}$$

$$980\left(\frac{1}{\pi}\right)^2 = L$$

$$99.29 \approx L$$

The string is about 99.29 cm.

Extraneous Solutions:

- Raising each side to a power could introduce ***extraneous solutions***.
- Check all solutions in the original equation.

$$8 + \sqrt[6]{5b} = 3$$

$$8 + \sqrt[6]{5b} = 3$$

$$\sqrt[6]{5b} = -5$$

$$5b = (-5)^6$$

$$5b = 15,625$$

$$b = 3125$$

Check:

$$8 + \sqrt[6]{5(3125)} \stackrel{?}{=} 3$$

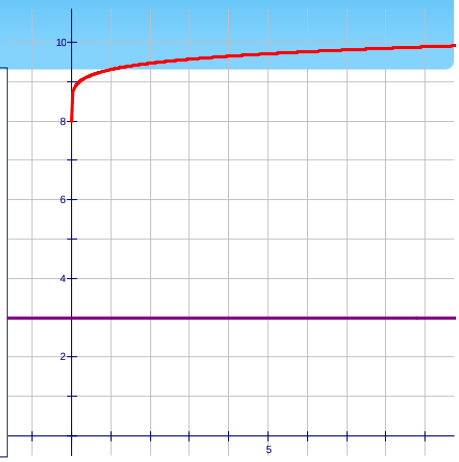
$$8 + \sqrt[6]{15,625} \stackrel{?}{=} 3$$

$$8 + 5 \neq 3$$

No Solution

Checking Using a Calculator

Check $8 + \sqrt[6]{5b} = 3$ using a calculator.



* Graph each side of the equation as an individual equation.
  * $Y_1 = 8 + \sqrt[6]{5b}$ and $Y_2 = 3$
* Use the INTERSECTION function to find the solution(s).

Homework: p. 395 #9-33 odd

Solving Equations with Two Radicals

What is the solution(s) of $2+\sqrt{x-6}-\sqrt{x+10}=0$?

$$2+\sqrt{x-6}-\sqrt{x+10}=0$$

$$2+\sqrt{x-6}=\sqrt{x+10}$$ ← Isolate one Radical Expression

$$\left(2+\sqrt{x-6}\right)^2=\left(\sqrt{x+10}\right)^2$$ ← Square Each Side

$$4+4\sqrt{x-6}+x-6=x+10$$

$$4\sqrt{x-6}=12$$ ← Isolate $4\sqrt{x-6}$

$$\sqrt{x-6}=3$$

$$\left(\sqrt{x-6}\right)^2=(3)^2$$ ← Square Each Side

$$x-6=9$$ ← Subtract 6 from each side

$$x=15$$

Homework: Complete WS 6-5G