

Key

Warm Up Unit 2 Lesson 2: Solving Equations with radicals/rational exponents

A. John is asked to solve the equation $2\sqrt{6x-5} + 20 = 6$. His work is shown below. Do you agree with John that the solution is $x = 9$? Why or why not?

Step One: $2\sqrt{6x-5} = -14$
 $\sqrt{6x-5} = -7$

Step Two: $(\sqrt{6x-5})^2 = (-7)^2$
 $6x-5 = 49$

~~neg~~

Step Three: $6x = 54$
 $x = 9$

Step 4: check!

$2\sqrt{6(9)-5} = -14$ $14 = -14$
 $2\sqrt{54-5} = -14$ false
 $2\sqrt{49} = -14$

B. Solve $(\sqrt{x-2})^2 = x-2$

$x-2 = x^2 - 4x + 4$
 $0 = x^2 - 5x + 6$
 $0 = (x-2)(x-3)$
 ~~$x=2$~~ ✓ ~~$x=3$~~ ✓

C. Solve: $-3x^{\frac{2}{3}} = -12$

extraneous

Is the "root" of the reciprocal rational exponent even?

$x^{\frac{2}{3}} = 4$
 $x = 4^{\frac{3}{2}}$

$x = (\pm\sqrt{4})^3$
 $x = (\pm 2)^3$ $x = \pm 8$

$x=2, x=3$

D. Solve $3(x+1)^{\frac{4}{3}} = 48$

$(x+1)^{\frac{4}{3}} = 16$
 $x+1 = \pm 16^{\frac{3}{4}}$ $\frac{3}{4} \notin \text{even}$
 $x+1 = (\pm\sqrt[4]{16})^3$
 $x+1 = (\pm 2)^3$

$x=7, x=-9$

$x+1 = \pm 8$
 $x+1 = 8$ $x+1 = -8$
 $x = 7$ $x = -9$

$x=3, x=-1$

~~$x=3$~~ ✓
 ~~$x=-1$~~ ✓

E. Solve: $(\sqrt{3x^2-2})^2 = (x+2)^2$

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

$2x^2 - 4x - 6 = 0$
 $x^2 - 2x - 3 = 0$

$(x-3)(x+1) = 0$

$\sqrt{\quad} \neq \text{neg}$

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F. Solve: $(\sqrt{x^2 + 9})^2 = (-5)^2$

$x^2 + 9 = 25$

$x^2 = 16$

$x = \pm 4$

~~NO EXTRA ANSWERS~~

G. Solve $(\sqrt{2x^3 + 2})^2 = (x + 1)^2$

$2x^3 + 2 = x^2 + 2x + 1$

$2x^3 - x^2 - 2x + 1 = 0$

$x^2(2x - 1) - 1(2x - 1) = 0$

$(x^2 - 1)(2x - 1) = 0$

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

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H. $(\sqrt{10 - 13r})^2 = (r - 4)^2$

$10 - 13r = r^2 - 8r + 16$

$0 = r^2 + 5r + 6$

$0 = (r + 2)(r + 3)$

$r = -2 \quad r = -3$

~~check for no solutions~~

I. $(4 + \sqrt{2x})^2 = (\sqrt{3x + 1})^2$

$4 + 8\sqrt{2x} + 2x$

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

SKIP

$4 + 2x - 3x - 1 + 8\sqrt{2x} = -2\sqrt{3x}$

$3 - 1x + 8\sqrt{2x} = -2\sqrt{3x}$

~~NO SOLUTIONS~~

When there is more than one radical and a constant, _____ the radicals!

J. $\sqrt{k - 9} - \sqrt{k} = -1$

$(\sqrt{k - 9})^2 = (\sqrt{k} - 1)^2$

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

$-10 = -2\sqrt{k}$

$5 = \sqrt{k}$

$25 = k$

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

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

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

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

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

$x - 5 = 4(x - 1)$

$x - 5 = 4x - 4$

L. Solve the equation $x - 4 = \sqrt{2x}$ by graphing.

Method 1: Graph both sides of the equation.

Method 2: Set the equation equal to zero.

$x^2 - 8x + 16 = 2x$

$x^2 - 10x + 16 = 0$

$(x - 8)(x - 2) = 0$

$x = 8$

$-1 = 3x$

~~$x = -1/3$~~

no soln.