# 5.5 notes

Tuesday, March 10, 2020 1:17 PM

PreCalc 11

## 5.5-Solving Radicals using Algebra

**Review**: $\sqrt{2} * \sqrt{2} =$ 2 $\quad$ $\sqrt{x} * \sqrt{x} =$ x $\quad$ $\sqrt{x-3} * \sqrt{x-3} =$ x − 3

Like solving by graphing, solving through algebra means to find the x-value(s) where the two functions cross or intersect.

To solve *algebraically* we must

① set radicand to ≥ 0
② solve for variable.

1) Identify the restriction(s) on the variable under the root. This is the same as determining the domain in which the function exists.
2) Isolate the radical on one side of the equation.
3) Square both sides of the equation to remove the radical.
4) Solve for x.
5) Make sure the x-value ① satisfies the restriction is within the domain of the function. Check your solution(s) back into any equation with a radical to make sure there are no extraneous sol'ns. ②

★ must check every time, every solution!

Solve using algebra:

$5 + \sqrt{2x-1} = 12$
$-5 \quad -5$
$(\sqrt{2x-1})^2 = (7)^2$
$2x - 1 = 49$
$+1 \quad +1$
$\frac{2x}{2} = \frac{50}{2}$
$x = 25$

Rest.
$2x - 1 \geq 0$
$+1 \quad +1$
$\frac{2x}{2} \geq \frac{1}{2}$
$x \geq \frac{1}{2}$

Check: $x = 25$
$5 + \sqrt{2x-1} = 12$
$5 + \sqrt{2(25)-1} = 12$
$5 + \sqrt{49} = 12$
$5 + 7 = 12$
$12 = 12$ ✓

Solve using algebra:

$$-8+\sqrt{\frac{3x}{5}}=-2$$

$+8 \quad +8$

$$\left(\sqrt{\frac{3x}{5}}\right)^2=(6)^2$$

$$(5)\frac{3x}{5}=36(5)$$

$$\frac{3x}{3}=\frac{180}{3}$$

$$x=60$$

Check:

$$-8+\sqrt{\frac{3(60)}{5}}=-2$$

$$-8+\sqrt{36}=-2$$

$$-8+6=-2$$

$$-2=-2 \checkmark$$

Rest. $\frac{3x}{5} \geq 0$ (5)

monomial

$$\frac{3x}{3} \geq 0$$

$$x \geq 0$$

$x \geq 0$

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

$-x \quad -x$

$$\left(\sqrt{x-1}\right)^2=(3-x)^2$$

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

$$x-1=9-3x-3x+x^2$$

$$x-1=9-6x+x^2$$

$+x \quad +1 \quad +1 \quad -x$

$$0=10-7x+x^2$$ ← rearrange

$$0=x^2-7x+10$$

Solve this quadratic:
- factor
- quadratic formula

$$\_+\_=-7$$
$$\_\cdot\_=10$$

$$0=(x-5)(x-2)$$

$$x-5=0 \qquad x-2=0$$

$+5 \quad +5 \qquad +2 \quad +2$

$x=5 \qquad x=2$

Rest. $x-1 \geq 0$

$+1 \quad +1$

$x \geq 1$

$x \geq 1$

Check: $x=5$

$$x+\sqrt{x-1}=3$$
$$(5)+\sqrt{(5)-1}=3$$
$$5+\sqrt{4}=3$$
$$5+2=3$$
$$7 \neq 3$$

extraneous solution

$x=2$

$$x+\sqrt{x-1}=3$$
$$(2)+\sqrt{(2)-1}=3$$
$$2+\sqrt{1}=3$$
$$3=3 \checkmark$$

① Rest. $2x+7 \geq 0$

① Rest. $2x+7 \geq 0$

$-7 \quad -7$

$\frac{2x}{2} \geq \frac{-7}{2}$

$x \geq -\frac{7}{2}$

$2x = -4 + 2\sqrt{2x+7}$

$+4 \quad +4$

$\frac{2x+4}{2} = \frac{2\sqrt{2x+7}}{2}$

$(x+2)^2 = (\sqrt{2x+7})^2$

$(x+2)(x+2) = 2x+7$

$x^2+4x+4 = 2x+7$

$-2x \quad -7 \quad -2x \quad -7$

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

$a=1 \quad b=2 \quad c=-3$

Check: $x=1$

$2(1) = -4+2\sqrt{2(1)+7}$

$2 = -4+2\sqrt{9}$

$2 = -4+6$

$2 = 2$ ✓

Check: $x=-3$

$2(-3) = -4+2\sqrt{2(-3)+7}$

$-6 = -4+2\sqrt{1}$

$-6 = -4+2$

$-6 = -2$ ✗

$x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$

$x = \frac{-(2) \pm \sqrt{(2)^2-4(1)(-3)}}{2(1)}$ – Calculator

$x = \frac{-2 \pm \sqrt{16}}{2}$

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

$x = \frac{-2-4}{2} = \frac{-6}{2} = -3$

★ 2 radicals:

isolate the worse one

$7+\sqrt{3x} = \sqrt{5x+4}+5$

$-5 \quad -5$

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

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

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

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

$-4 \quad -3x \quad -3x \quad -4$

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

$16(3x) = 4x^2$

$48x = 4x^2$

$-48x \quad -48x$

$0 = 4x^2-48x$

$4$

$0 = x^2-12x$

$0 = x(x-12)$

$x=0$ $\quad$ $x=12$

Check

$7+\sqrt{3x} = \sqrt{5x+4}+5$

$7+\sqrt{3(0)} = \sqrt{5(0)+4}+5$

$7+\sqrt{0} = \sqrt{4}+5$

$7 = 7$ ✓

Check.

$7+\sqrt{3x} = \sqrt{5x+4}+5$

$7+\sqrt{3(12)} = \sqrt{5(12)+4}+5$

$7+\sqrt{36} = \sqrt{64}+5$

$7+6 = 8+5$

Rest. ★ with 2 radicals!

$3x \geq 0$

$x \geq 0$

$5x+4 \geq 0$

$-4 \quad -4$

$\frac{5x}{5} \geq \frac{-4}{5}$

$x \geq -\frac{4}{5}$

analyze:

$x=0$

$\sqrt{3(0)} = \sqrt{0}$ ✓

$\sqrt{5(0)+4} = \sqrt{4}$ ✓

$x = -\frac{4}{5}$

$\sqrt{3(-\frac{4}{5})} = \sqrt{-\frac{12}{5}}$

Not ok!

HW: 5.5 WS

Other 2 radical example that doesn't require doing steps #2-5 twice:

$\sqrt{3x}+\sqrt{5x+4} = 0$

$-\sqrt{3x} \quad\quad \sqrt{3x}$

$(\sqrt{5x+4})^2 = (-\sqrt{3x})^2$

$5x+4 = +(3x)$

$-3x \quad -3x$

$2x+4 = 0$

$-4 \quad -4$

$\frac{2x}{2} = \frac{-4}{2}$

Check: $x = -2$ …

$7 + \sqrt{0} = \sqrt{4} + 5$

$7 = 2 + 5$

$7 = 7$ ✓

$7 + \sqrt{36} = \sqrt{64} + 5$

$7 + 6 = 8 + 5$

$13 = 13$ ✓