

Solve the following Radical Equations:

$$1) \quad 7 + \sqrt{3x} = \sqrt{5x+4} + 5, \quad x \geq 0$$

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

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

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

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

$$48x = 4x^2$$

$$0 = 4x^2 - 48x$$

$$0 = 4x(x-12)$$

4x=0

$$x=0$$

or

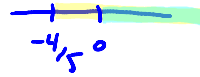
$$x=12$$

Restrictions

$$3x \geq 0 \text{ and } 5x+4 \geq 0$$

$$x \geq 0$$

$$x \geq -4/5$$



check 0

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

$$7 = 2 + 5 \quad \checkmark$$

check 12

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

$$7 + 6 = 8 + 5 \quad \checkmark$$

$$2) \quad \sqrt{x-2} + \sqrt{3x-3} = 3, \quad x \geq 2$$

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

$$x-2 = 9 - 6\sqrt{3x-3} + 3x-3$$

$$6\sqrt{3x-3} = 2x + 8$$

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

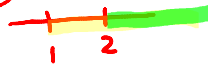
$$9(3x-3) = x^2 + 8x + 16$$

$$27x - 27 = x^2 + 8x + 16$$

$$0 = x^2 - 19x + 43$$

Restriction

$$x \geq 2 \text{ or } x \geq 1$$



$$a = 1$$

$$b = -19$$

$$c = 43$$

$$x = \frac{19 \pm \sqrt{361 - 4(1)(43)}}{2} = \frac{19 \pm \sqrt{189}}{2} = \frac{19 \pm 3\sqrt{21}}{2}$$

check?

use decimals.
 ~~$x = 16/4$~~

check
 $x = 2.6$

$\sqrt{14.4} + \sqrt{46.2} = 3$ No!

$\sqrt{0.6} \neq \sqrt{3(2.6)-3} = 3$
 $0.8 + 2.2 = 3$ ✓

$$x = \frac{19 - 3\sqrt{21}}{2}$$

Note: Extraneous roots are likely to occur when...

- a negative number is squared
- if variables are squared on both sides of the equation.

Example: Which of the following may have an extraneous root?

a) $\sqrt{4m+2} = 11$

NO

$\sqrt{4m+2} = \text{pos}$ ✓

$4m+2 = 121$

$4m = 119$

$m = \frac{119}{4}$

b) $\sqrt{x+6} = -12$

yes

$\sqrt{x+6} = \text{pos, not a neg!}$

root $x = 158$ is extraneous

c) $\sqrt{6x+7} = x$

possible

- Variables on both sides.

$6x+7 = x^2$

$0 = x^2 - 6x - 7$

$0 = (x-7)(x+1)$

$x = 7, x = -1$

extraneous

Assignment: p301 # 7abd, 8abc, 10bd, 12, 16

Quiz: - Dividing ✓
 - Rationalizing denominators ✓
 - Radical equations ✓

next class

bin. ✓
 none

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

Restrictions?



Quiz: - Dividing ✓
 next class - Rationalizing denominators ✓
 - Radical equations ✓

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

Restrictions?

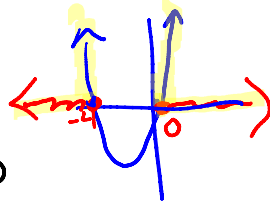
$x^2+4x \geq 0$
 $x(x+4) \geq 0$

Both pos. OR Both neg.

Both pos. - OR - Both neg.

$x \geq 0$ and $x \geq -4$ $x \leq 0$ and $x \leq -4$

$x \geq 0$ OR $x \leq -4$



$\sqrt{x^2-4}$

$x^2-4 \geq 0$
 $x^2 \geq 4$

$x \leq -2$ or $x \geq 2$

