

Do Now:

Solve for x.

1. $(\sqrt{x^2 - 6x})^2 = (x - \sqrt{2x})^2$

$$\cancel{x^2} - 6x = \cancel{x^2} - 2x\sqrt{2x} + 2x$$

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

$$4x = x\sqrt{2x}$$

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

$$16x^2 = 2x^3$$

$$0 = 2x^3 - 16x^2$$

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

Classwork:
 Solve for x.

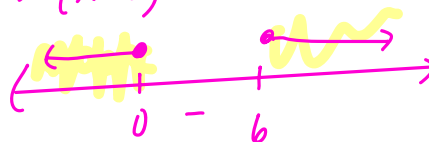
$$x = 0, 8$$

$$x^2 - 6x \geq 0$$

$$x(x - 6) \geq 0$$

$$2x \geq 0$$

$$x \geq 0$$



$$x - \sqrt{2x} \geq 0$$

final restrictions:

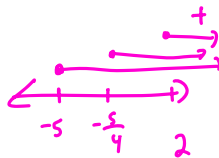
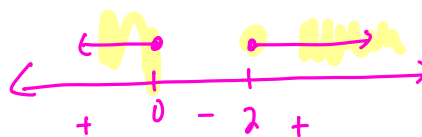
$$\{0\} \cup [6, \infty)$$

$$x \geq \sqrt{2x}$$

$$x^2 \geq 2x$$

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

$$x(x - 2) \geq 0$$



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

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

$$x \geq -5$$

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

$$x \geq 2$$

$$2x+6 \geq 0$$

$$x \geq -3$$

$$4x+12 = 2\sqrt{4x^2+25x+25}$$

$$(2x+6)^2 = (\sqrt{4x^2+25x+25})^2$$

final restriction:

$$[2, \infty)$$

$$\cancel{4x^2} + 24x + 36 = \cancel{4x^2} + 25x + 25$$

$$11 = x$$

8. $2\sqrt{x+1} = \frac{6\sqrt{x}}{\sqrt{x}}$ $x > 0$

$$2x + \sqrt{x} = 6$$

$$(\sqrt{x})^2 = (6 - 2x)^2$$

$$x = 4x^2 - 24x + 36$$

$$0 = 4x^2 - 25x + 36$$

$$0 = (4x-9)(x-4)$$

$$x = \frac{9}{4} \text{ reject}$$

$$6 - 2x \geq 0$$

$$6 \geq 2x$$

$$3 \geq x$$

final restrictions
 $(0, 3]$

$$\sqrt{4x+5} - \sqrt{x+5} \geq 0$$

↑ automatically true if $x \geq 2$

Name: Key
 PCH: More Solving Radical Equations

Date: _____
 Ms. Loughran

Do Now:
 Solve for x.

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

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

$$2 = 2\sqrt{4x-3}$$

$$1 = \sqrt{4x-3}$$

$$1 = 4x-3$$

$$4 = 4x$$

$$1 = x$$

R
 $x \geq 0$

$$4x-3 \geq 0$$

$$x \geq \frac{3}{4}$$

$$\sqrt{4x-3} + 1 \geq 0$$

$$\sqrt{4x-3} \geq -1$$

always +

no

restriction
 needed

Classwork:
 Solve for x.

1. $\sqrt{x+6} = \sqrt{x+3} + 1$

$$x+6 = x+3 + 2\sqrt{x+3} + 1$$

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

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

$$1 = x+3$$

$$-2 = x$$

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

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

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

$$4 = 2\sqrt{x-3}$$

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

$$4 = x-3$$

$$7 = x$$

$$x+2 \geq 0$$

$$x \geq -2$$

$$x-3 \geq 0$$

$$x \geq 3$$

$1 + \sqrt{x+3} \geq 0$
 always \oplus

OR

$$-1 + x \geq 0$$

$$x \geq 1$$

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

$$2x-1 - 2\sqrt{x^2-x-6} = 1$$

$$-2\sqrt{x^2-x-6} = 2-2x$$

$$\sqrt{x^2-x-6} = -1+x$$

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

$$x = 7$$

R

$$x+6 \geq 0$$

$$x \geq -6$$

$$x+3 \geq 0$$

$$x \geq -3$$

$$\sqrt{x+3} + 1 \geq 0$$

always

$$\begin{aligned} R \\ 5-2x > 0 \\ -2x > -5 \\ x < \frac{5}{2} \end{aligned}$$

$$\begin{aligned} x-1 > 0 \\ x > 1 \end{aligned}$$

$$\begin{aligned} 2-\sqrt{x-1} &\geq 0 \\ =\sqrt{x-1} &\geq -2 \\ \sqrt{x-1} &\leq 2 \\ x-1 &\leq 4 \\ x &\leq 5 \end{aligned}$$

$$3. \sqrt{5-2x} + \sqrt{x-1} = 2$$

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

$$5-2x = x-1 - 4\sqrt{x-1} + 4$$

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

$$9x^2 + 12x + 4 = 16(x-1)$$

$$9x^2 - 12x + 4 = 16x - 16$$

$$9x^2 - 28x + 20 = 0$$

$$9x^2 - 10x - 18x + 20 = 0$$

$$x(9x-10) - 2(9x-10) = 0$$

$$5. \sqrt[3]{x-5} + 3 = 0$$

$$\sqrt[3]{x-5} = -3$$

$$x-5 = -27$$

$$x = -22$$

$$\begin{aligned} 2x+1 > 0 \\ x > -\frac{1}{2} \end{aligned}$$

$$\begin{aligned} x-3 > 0 \\ x > 3 \end{aligned}$$

$$\begin{aligned} 2-\sqrt{x-3} > 0 \\ -\sqrt{x-3} > -2 \\ x-3 &\leq 4 \\ x &\leq 7 \end{aligned}$$

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

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

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

$$x = -4\sqrt{x-3}$$

$$x \leq 0$$

final restrictions:
 $[-\frac{1}{2}, 0]$

$$-2-3x \leq 0$$

$$-3x \leq 2$$

$$x \geq -\frac{2}{3}$$

$$\therefore [1, \frac{5}{2}]$$

$$(9x-10)(x-2) = 0$$

$$x = \frac{10}{9} \quad x = 2$$

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

$$x^2 - 16x + 48 = 0$$

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

$$x = 12, 4$$

\emptyset

$$6. \sqrt[4]{2x-8} = \sqrt[4]{6-5x}$$

\emptyset

$$\begin{aligned} R \\ 2x-8 > 0 \end{aligned}$$

$$x > 4$$

$$6-5x > 0$$

$$-5x > -6$$

$$x \leq \frac{6}{5}$$

not possible