

## 5.3 Solving Equations involving Radicals

ex) State restrictions on  $x$ , and solve  $3 + \sqrt{x+2} = 8$

Restrictions

$$\begin{aligned} x+2 &\geq 0 \\ -2 \quad -2 \\ x &\geq -2 \end{aligned}$$

$$\begin{aligned} 3 + \sqrt{x+2} &= 8 \\ -3 \qquad \qquad -3 \end{aligned}$$

Isolate radical

$$\sqrt{x+2} = 5^2$$

Square both sides

$$\begin{aligned} x+2 &= 25 \\ -2 \quad -2 \\ x &= 23 \end{aligned}$$

Verify:

$$3 + \sqrt{23+2} = 8$$

$$3 + \sqrt{25} = 8$$

$$3 + 5 = 8$$

$$8 = 8 \checkmark$$

ex) State restrictions & solve  $\sqrt{2x+7}+3=x-1$

Restrictions

$$2x+7 \geq 0$$

$$\begin{array}{cc} -7 & -7 \end{array}$$

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

$$x \geq -3.5$$

$$\sqrt{2x+7}^2 = (x-4)^2 \quad (x-4)(x-4)$$

$$2x+7 = x^2 - 8x + 16$$

$$\begin{array}{cc} -2x & -7 \end{array} \quad \begin{array}{cc} -2x & -7 \end{array}$$

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

$$0 = (x-9)(x-1)$$

$$x-9=0 \quad x-1=0$$

$$x=9$$

$$x=1$$

These are 2 possible solns.

extraneous

Verify:

$$\sqrt{2(9)+7} + 3 = 9-1$$

$$8=8$$

Verify:

$$\sqrt{2(1)+7} + 3 = 1-1$$

$$6=0$$

ex) Solve & state restrictions for:

$$\sqrt{3x-5} + 1 = 4 + \sqrt{x-2}$$

Isolate the more complex radical 1st.

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

$$3x-5 \geq 0$$

$$3x \geq 5$$

$$x \geq 5/3$$

$$x-2 \geq 0$$

$$x \geq 2$$

$$3x-5 = 9 + 3\sqrt{x-2} + 3\sqrt{x-2} + x-2$$

$$3x-5 = 9 + 6\sqrt{x-2} + x-2$$

$$(2x-12)^2 = (6\sqrt{x-2})^2$$

$$4x^2 - 48x + 144 = 36(x-2)$$

$$4x^2 - 48x + 144 = 36x - 72$$

Verify:

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

$$3 \neq 5$$

$$\frac{4x^2}{4} - \frac{84x}{4} + \frac{216}{4} = \frac{0}{4}$$

$$x^2 - 21x + 54 = 0$$

$$\sqrt{3(18)-5} + 1 = 4 + \sqrt{18-2}$$

$$8 = 8$$

$$(x-3)(x-18) = 0$$

$$x \neq 3 \quad x = 18$$

pg. 300 Read "KEY IDEAS"

pg. 300-302 #5, 6-9 (choose some), 10, 13-16