5.5 WS - Solving Radical Equations – Algebraically

Solving the following equations algebraically, state restrictions, check your solutions and show your work.

1. $(\sqrt{2x+31})^2=(x-2)^2$

$x \geq \frac{-31}{2}$

$2x+31 = x^2-4x+4$

$-2x \quad -31 \quad -2x \quad -31$

$0 = x^2-6x-27$

$0=(x-9)(x+3)$

$x=9$ ~~$x=-3$~~

Check:

$\sqrt{2(-3)+31} = (-3)-2$

$5 = -5$ ×

$\sqrt{2(9)+31} = (9)-2$

$7 = 7$ ✓

2. $\left(\frac{1}{3}\sqrt{-4-m}\right)^2=\left(\frac{1}{3}\right)^2$

$m \leq -4$

$-4-m = 1$

$-5 = m$

Check:

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

$\frac{1}{3} = \frac{1}{3}$ ✓

$-4-m \geq 0$

$-m \geq 4$

$m \leq -4$

3. $(\sqrt{6x+3})^2=(x+2)^2$

$x \geq -\frac{1}{2}$

$6x+3 = x^2+4x+4$

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

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

$x=1$

Check:

$\sqrt{6(1)+3} = (1)+2$

$3 = 3$ ✓

4. $(b)^2=(\sqrt{-10+7b})^2$

$b \geq \frac{10}{7}$

$b^2 = -10+7b$

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

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

$b=2$

$b=5$

Check:

$(2) = \sqrt{-10+7(2)}$

$2 = 2$ ✓

$(5) = \sqrt{-10+7(5)}$

$5 = 5$ ✓

5. $(2\sqrt{-12+8x})^2=(2x)^2$

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

$4(-12+8x) = 4x^2$

$0 = x^2-8x+12$

$0=(x-6)(x-2)$

$x=2$

$x=6$

Check:

$2\sqrt{-12+8(2)} = 2(2)$

$4 = 4$ ✓

$2\sqrt{-12+8(6)} = 2(6)$

$12 = 12$ ✓

6. $(\sqrt{4n-7})^2=(5)^2$

$4n-7 = 25$

$4n = 32$

$n = 8$

$n \geq \frac{7}{4}$

Check:

$\sqrt{4(8)-7} = 5$

$5 = 5$ ✓

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

$x \geq 0$

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

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

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

~~$x=2$~~

$x=8$

Check:

$(2)-4 = \sqrt{2(2)}$

$-2 = 2$ ×

$(8)-4 = \sqrt{2(8)}$

$4 = 4$ ✓

8. $2(x+1)^2=2\sqrt{3x+31}^2$

$x^2+2x+1 = 3x+31$

$x^2-x-30 = 0$

$(x-6)(x+5) = 0$

$x=6$

~~$x=-5$~~

$x \geq -\frac{31}{3}$

Check:

$2(6+1) = 2\sqrt{3(6)+31}$

$14 = 14$ ✓

$2(-5+1) = 2\sqrt{3(-5)+31}$

$-8 = 8$ ×

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

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

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

$x^2+4x+4 = 4(2x+1)$

$x^2+4x+4 = 8x+4$

$x^2-4x = 0$

$x(x-4) = 0$

~~$x=0$~~

$x=4$

$x \geq -\frac{1}{2}$

Check:

$\sqrt{3(0)+4} = 1+\sqrt{2(0)+1}$

$2 = 2$ ✓

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

$4 = 4$ ✓

Solutions

1. x=9 2. m=-5 3. x=1 4. x=2,5 5. x=2,6 6. x=8 7. x=8 8. x=6 9. x=0,4