

Lesson 1.3: Solving Radical Equations

Ex 1: Solve.

$$\underline{x^2} + \underline{3x} = -2$$

+2 +2

① Set equation equal to 0.

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

② Factor

$$\underline{(x + 2)} \underline{(x + 1)} = 0$$

$$x + 2 = 0$$

-2 -2

$$x = -2$$

$$x + 1 = 0$$

$$x = -1$$

Ex 2: Solve.

$$\begin{array}{r} 2x^2 = -7x - 6 \\ +7x \quad +7x \quad +6 \\ +6 \end{array}$$

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

$$(2x + 3)(x + 2) = 0$$

$$\begin{array}{r} 2x + 3 = 0 \\ -3 \quad -3 \end{array}$$

$$\begin{array}{r} 2x = -3 \\ 2 \quad 2 \end{array}$$

$$x = -1.5$$

$$x + 2 = 0$$

$$x = -2$$

Solving Radicals

1. Isolate the Radical
2. Eliminate the Radical
3. Solve for x .
4. Check for extraneous solutions.

Ex 3: Solve.

$$\boxed{\sqrt{2x}} - 1 = 4$$

$$\left(\sqrt{2x}\right)^{\overset{+1}{2}} = \left(5\right)^{\overset{+1}{2}}$$

$$\frac{2x}{\underline{2}} = \frac{25}{\underline{2}}$$

$$\boxed{x = 12.5}$$

$$\frac{\sqrt{2(12.5)} - 1}{4} = \frac{4 - 1}{4} = \frac{3}{4} \neq 4 \quad \checkmark$$

Ex 4: Solve.

$$\frac{3}{3}\sqrt{x+2} = \frac{27}{3}$$

$$(\sqrt{x+2})^2 = (9)^2$$

$$x+2 = 81$$

$$\begin{array}{r} -2 \quad -2 \end{array}$$

$$\boxed{x = 79}$$

Check:

$$\boxed{3\sqrt{79+2}} = 27$$

$$27 = 27 \checkmark$$

Ex 5: Solve.

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

Check:

$$\sqrt[3]{2(31.5) + 1} - 3 = 1$$

$$1 = 1 \checkmark$$

$$\left(\sqrt[3]{2x + 1}\right)^3 = (4)^3$$

$$2x + 1 = 64$$

$$\frac{2x}{2} = \frac{63}{2}$$

$$x = 31.5$$

Ex 6: Solve.

$$(\sqrt{3x + 40})^2 = (x)^2$$

$$3x + 40 = x^2$$
$$-3x - 40 \quad -3x - 40$$

$$0 = x^2 - 3x - 40$$

$$0 = (x - 8)(x + 5)$$

$$x - 8 = 0$$

$$x = 8$$

$$x + 5 = 0$$

$$x = -5$$

$$\sqrt{3x+40} = x$$

$$x = 8$$

$$\sqrt{3(8)+40} = 8$$

$$8 = 8 \checkmark$$

$$\cancel{x = -5}$$

$$\sqrt{3(-5)+40} = -5$$

$$\sqrt{25} = -5$$

$$5 \neq -5$$

extraneous.

Ex 7: Solve.

$$\left(\sqrt{2x}\right)^2 = \underbrace{(x-4)^2}_{\text{FOIL!}}$$

$$\begin{array}{r} 2x \\ -2x \end{array} = x^2 - 8x + 16$$

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

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

$$x-8=0$$

$$\boxed{x=8}$$

$$x-2=0$$

$$\boxed{x=2}$$

Check: $\sqrt{2x} = x - 4$

$x = 8$ ✓

~~$x = 2$~~

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

$4 = 4$ ✓

$\sqrt{2 \cdot 2} = 2 - 4$

$2 \neq -2$

Ex 8: Solve.

$$\sqrt[3]{(x+1)^2}$$

$$x+1 = 64$$

-1 -1

$$x = 63$$

$$\left((x+1)^{\frac{2}{3}} \right)^{\frac{3}{2}} = (16)^{\frac{3}{2}}$$

$$x+1 = \pm 64$$

$$x+1 = -64$$

-1 -1

$$x = -65$$

$\frac{3}{2}$
↓
Even denominator
you will have
a \pm
answer.

Ex 9: Solve. $\frac{2(x-2)^{\frac{3}{4}}}{2} = \frac{16}{2}$

$$\left((x-2)^{\frac{3}{4}} \right)^{\frac{4}{3}} = (8)^{\frac{4}{3}}$$

$$\begin{array}{r} x-2 = 16 \\ +2 \quad +2 \end{array}$$

$$\boxed{x=18}$$

$$\textcircled{16} \quad \underline{(2x+3)}^{3/4} - 3 = 5$$

$+3 \qquad +3$

$$\left((2x+3)^{3/4} \right)^{4/3} = (8)^{4/3} - \text{odd (one answer)}$$

$$2x+3 = 16$$

$-3 \qquad -3$

$$\underline{2x} = \underline{13}$$

$2 \qquad 2$

$$x = 6.5$$

$$(18) \quad (x-6)^2 = (\sqrt{18-3x})^2$$

$$(x-6)(x-6)$$

FOIL!

$$x^2 - 6x - 6x + 36 = 18 - 3x$$

$$x^2 - 12x + 36 = 18 - 3x$$

$$+ 3x \quad - 18 \quad - 18 + 3x$$

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

$$(x-6)(x-3) = 0$$

$$x-6=0$$

$$x-3=0$$

$$\begin{array}{l} x=6 \\ x=3 \end{array}$$

$$\boxed{x=6}$$

$$\cancel{x=3}$$

$$6-6 = \sqrt{18-3(6)}$$

$$0 = \sqrt{0}$$

$$0 = 0 \checkmark$$

$$3-6 = \sqrt{18-3(3)}$$

$$-3 \neq 3$$

$$\textcircled{3} \quad X^3 + 6X^2 - 7X + \cancel{9} = \cancel{9}$$

$$\frac{X^3}{X} + \frac{6X^2}{X} - \frac{7X}{X} = 0$$

$$X(X^2 + 6X - 7) = 0$$

$$X \underbrace{(X + 7)}_{\downarrow} \underbrace{(X - 1)}_{\downarrow} = 0$$

$X = 0$ $X + 7 = 0$ $X - 1 = 0$

$X = -7$ $X = 1$