SOLVE RADICAL equations

Radicals on one side

If two expressions are equal, then their squares are equal.

If $a = b$, then $a^2 = b^2$

If $\sqrt{x} = 5$, then $(\sqrt{x})^2 = 5^2$

Example 1: $\sqrt{x} + 3 = 10$

$-3 \quad -3$

$\sqrt{x} = 7$

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

$\boxed{x = 49}$

Example 2: $-3\sqrt{x} = -18$

$\frac{-3\sqrt{x}}{-3} = \frac{-18}{-3}$

$\sqrt{x} = 6$

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

$\boxed{x = 36}$

You Try! $2\sqrt{x} - 5 = -1$

$+5 \quad +5$

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

$\sqrt{x} = 2$

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

$\boxed{x = 4}$

Radicals on both sides

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

$$(\sqrt{x+4})^2 = (\sqrt{2x-1})^2$$

$$x + 4 = 2x - 1$$
$$-x \qquad\qquad -x$$

$$4 = x - 1$$
$$+1 \qquad\quad +1$$

$$\boxed{5 = x}$$

You Try! $\sqrt{3x+8} = \sqrt{x+4}$

$$(\sqrt{3x+8})^2 = (\sqrt{x+4})^2$$

$$3x + 8 = x + 4$$
$$-x \qquad\qquad -x$$

$$2x + 8 = 4$$
$$-8 \quad -8$$

$$\frac{2x}{2} = \frac{-4}{2}$$

$$\boxed{x = -2}$$

Extraneous Solutions

Example 1: Solve the equation. Check for extraneous solutions

$x = \sqrt{42-x}$

$(x)^2 = (\sqrt{42-x})^2$

$x^2 = 42 - x$

$x^2 + x - 42 = 0$

$(x-6)(x+7) = 0$

$x - 6 = 0 \qquad x + 7 = 0$

$x = 6 \qquad x = -7$

CHECK

$x = 6$

$6 = \sqrt{42-6}$

$6 = \sqrt{36}$

$6 = 6$

✓

$x = -7$

$-7 = \sqrt{42-(-7)}$

$-7 = \sqrt{49}$

$-7 \neq 7$

You Try! Solve the equation. Check for extraneous solutions

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

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

$2-x = (x+4)(x+4)$

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

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

$-2+x \qquad +x \; -2$

$0 = x^2+9x+14$

$0 = (x+7)(x+2)$

$x+7=0 \qquad x+2=0$

$x=-7 \qquad x=-2$

CHECK

$x=-7$

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

$\sqrt{9} = -3$

$3 \neq -3$

$x=-2$

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

$\sqrt{4} = 2$

$2 = 2$

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