### Concept

A <u>Radical Equation</u> contains a variable within a radical or a variable raised to a non-integer rational exponent.

Examples
$$\sqrt{x-4} = 7 \quad (x+5)^{\frac{1}{2}} = 9 \quad \sqrt[3]{x^2-5} = 2$$

Non-Examples

 $\sqrt{x} + 9$  (no equal sign)

x - 12 = 6 (no radical or non-integer rational exponent)

 $(x+4)^{\frac{1}{2}}$  (no equal sign)

### Concept

### Steps to Solve a Radical Equation

- 1. **Isolate the radical expression.** If the equation contains more than one radical expression, choose one to isolate.
- 2. Raise both sides of the equation to the <u>appropriate</u> power so the isolated root and power cancel.
- 3. **Solve the resulting equation.** Be aware of whether the equation is linear or quadratic.
- 4. Check for Extraneous Solutions and then write the final solution set.

### Radical equations can have extraneous solutions:

- 1. Solutions that fail to make the left side and right side of the equation equal.
- 2. Solutions that are imaginary or create imaginary values when substituted into the original equation.

# Objective: Solve square root equations algebraically. Ex) Solve the equation. $\sqrt{x^2 - 5} = 2$ $2 (f_{X^2-5}) = (2)$ $\chi^2 = 9$ $\sqrt{x^2} = \pm \sqrt{9}$ solutions: X=-3, 3 $\sqrt{4}=2$ 2=2

### Objective: Solve square root equations algebraically. Ex) Solve the equation. $\sqrt{x^2 + 1} = 7$ $\chi^2 = 48$ $\int x^2 = \pm \int \frac{48}{16.53}$ $\chi = -4\sqrt{3}, 4\sqrt{3}$ (4) check: x = -453; $5(-453)^2 + 1 = 7$ $\sqrt{49} = 7$ 7 = 7solutions. $\chi = -4\sqrt{3}$ , $4\sqrt{3}$ $\chi = 4\sqrt{3}$ ; $\sqrt{(4\sqrt{3})^2 + 1} = 7$ フ゠フノ

Ex) Solve the equation.

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(x-1)\frac{1}{2} = 16

same as: 
$$\sqrt{x-1} = 16$$

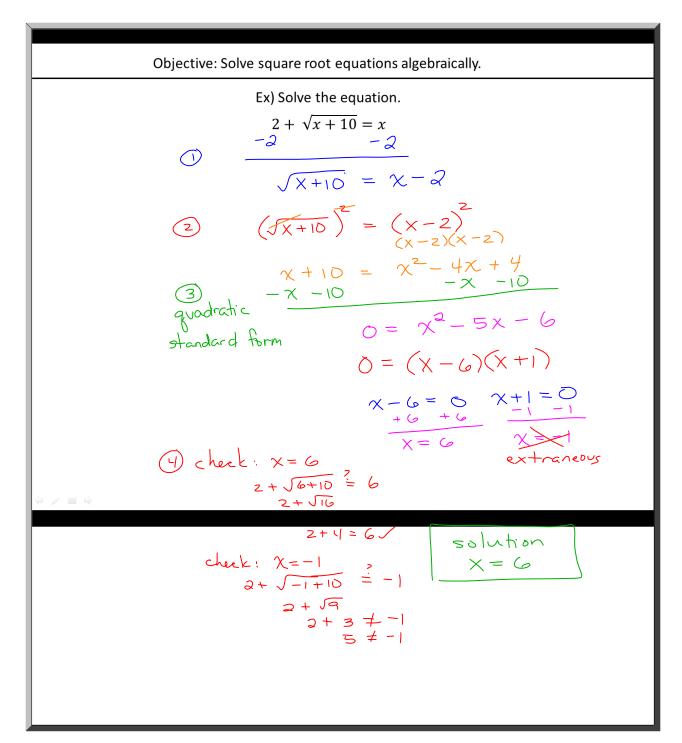
(x-1)\frac{2}{2} = (16)\frac{2}{3}

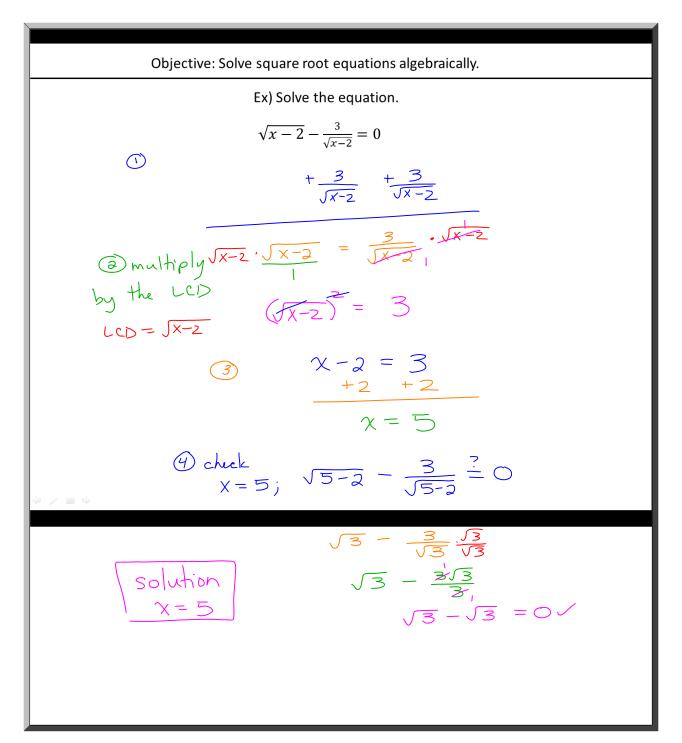
\times - 1 = 256 \\ + 1 \\ \tau = 257 - 1 \\ \frac{2}{3} = 16

\tag{556} = 16

\tag{16} = 1657

Solution: 
$$\chi = 257$$





## Objective: Solve square root equations algebraically. Ex) Solve the equation. $(x+6)^{\frac{1}{2}} - (2x-4)^{\frac{1}{2}} = 0$ same as: $\sqrt{\chi+6} - \sqrt{2\chi-4} = 0$ $+\sqrt{2\chi-\gamma}$ $+\sqrt{2\chi-\gamma}$ $(3) \qquad (5x+6)^2 = (52x-4)^2$ (9) check: X=10; √10+6 - √2(10)-4 = 0 0 = 0/ solution: X = 10

#### Closure

Jessica solved a square root equation. Her work is shown. Is her solution correct? Explain your reasoning.

$$\sqrt{x^2 + 29} = 2$$

$$\left(\sqrt{x^2 + 29}\right)^2 = (2)^2$$

$$x^2 + 29 = 4$$

$$x^2 = -25$$

$$\sqrt{x^2} = \pm \sqrt{-25}$$

$$x = \pm 5i$$

solution: x = -5i, 5i

Jessica's solution is incorrect. Solutions that are imaginary are extraneous for radical equations. She should have concluded there is no solution to the equation.