

# Solving Radical Equations

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## PRE-CALCULUS 11 RADICALS SOLVING RADICAL EQUATIONS

### A. Definitions

1. **radical equation:** an equation that contains at least one radical whose radicand contains a variable.

$$3\sqrt{x} = 12$$

$$7\sqrt{2x-1} = 3\sqrt{x+5} - 9$$

2. **extraneous root:** a solution to a radical equation that when checked does not satisfy the original equation.

### B. Solving Radical Equations

Solve the following algebra equations and verify the solutions.

$$3x + 2 = -10$$

$$\frac{3}{3}x = \frac{-12}{3}$$

$$x = -4$$

check

$$3x + 2 = -10$$

$$3(-4) + 2 = -10$$

$$-12 + 2 = -10$$

$$-10 = -10 \checkmark$$

$$2x - 4 = 4x + 6$$

$$-2x - 4 = 6$$

$$-\frac{2}{2}x = \frac{10}{2}$$

$$x = -5$$

check

$$2x - 4 = 4x + 6$$

$$2(-5) - 4 = 4(-5) + 6$$

$$-10 - 4 = -20 + 6$$

$$-14 = -14 \checkmark$$

1. Solve each radical equation and verify the solution.

a)  $3\sqrt{x} = 2$

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

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

$$(\sqrt{x})^2 = \left(\frac{2}{3}\right)^2$$

$$x = \frac{4}{9}$$

check

$$3\sqrt{x} = 2$$

$$3\sqrt{\frac{4}{9}} = 2$$

$$3\left(\frac{2}{3}\right) = 2$$

$$2 = 2 \checkmark$$

To Solve

a) Isolate the root.

b) To eliminate the root we square both sides.

c) Check for an extraneous root.

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

$$4\sqrt{x+1} = \frac{8}{4}$$

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

$$x + 1 = 4$$

$$x = 3$$

check

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

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

$$4\sqrt{4} - 5 = 3$$

$$8 - 5 = 3$$

$$3 = 3 \checkmark$$

$$* c) \sqrt{x+1} + 6 = 3$$

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

$$x + 1 = 9$$

$$x = 8 \leftarrow \text{Extraneous Root}$$

No Solution.

check.

$$\sqrt{x+1} + 6 = 3$$

$$\sqrt{(8)+1} + 6 = 3$$

$$\sqrt{9} + 6 = 3$$

$$3 + 6 = 3$$

$$9 = 3 \otimes$$

2. Determine whether the given value is a root of the equation.

$$a) 3\sqrt{x-2} - 1 = 8; x = 11$$

$$3\sqrt{(11)-2} - 1 = 8$$

$$3\sqrt{9} - 1 = 8$$

$$9 - 1 = 8$$

$$8 = 8 \checkmark$$

It is a root.

$$b) \sqrt{2x-4} = \sqrt{3x-5}; x = 1$$

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

$$\sqrt{2-4} = \sqrt{3-5}$$

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

this is unsolvable, therefore it is considered an extraneous root

It is not a root.

Assignment: Pg. 145 #4, 5, 6