Algebra 1

Lesson 11.3B

Solve Radical Equations

Warm-Up

Solve.

(a) $2x+3=13$

$2x=10$

$x=5$

(b) $x^2-x=12$

$x^2-x-12=0$

$(x-4)(x+3)=0$

$x=-3,4$

(c) $2\sqrt{x}+5=15$

$2\sqrt{x}=10$

$\sqrt{x}=5$

$x=25$

Example 1. Solve an Equation with Radicals on Both Sides

Solve and check for extraneous solutions.

(a) $\sqrt{3x-3}=\sqrt{2x+8}$

$3x-3=2x+8$

$x=11$

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

$\sqrt{30}=\sqrt{30}$ ✓

(b) $\sqrt{5x-4}=\sqrt{3x+20}$

$5x-4=3x+20$

$2x=24$

$x=12$

$\sqrt{5(12)-4}=\sqrt{3(12)+20}$

$\sqrt{56}=\sqrt{56}$ ✓

Example 2. Solving Equations with an Extraneous Solution

Solve and check for extraneous solutions.

(a) $\sqrt{20-x}=x$

$20-x=x^2$

$0=x^2+x-20$

$0=(x-4)(x+5)$

$x=4,-5$

$\sqrt{20-4}=4$ ✓ $\quad\sqrt{20+5}=-5$

$\sqrt{16}=4$ $\quad\sqrt{25}\neq -5$

$4=4$ ✓ extraneous solution

$x=4$ is the only solution

(b) $x=\sqrt{2x+15}$

$x^2=2x+15$

$x^2-2x-15=0$

$(x-5)(x+3)=0$

$x=5,-3$

$5=\sqrt{10+15}$ ✓ $\quad-3=\sqrt{-6+15}$

$5=\sqrt{25}$ $\quad-3=\sqrt{9}$ $\quad-3\neq 3$

$5=5$ ✓ extraneous solution

$x=5$ is the only solution

Try It!
Solve and check for extraneous solutions.

(a) $\sqrt{7+6x} = x$

$7+6x = x^2$

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

$0 = (x-7)(x+1)$

$x = -1, 7$

$\sqrt{7-6} = -1$ $\quad$ $\sqrt{7+42} = 7$

$1 \neq -1$ $\quad$ $7 = 7$ ✓

extraneous

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

$x+4 = 2x-1$

$5 = x$

$x = 5$

$\sqrt{9+5} = \sqrt{10-1}$

$3 = 3$ ✓

(c) $\sqrt{3x+4} = x$

$3x+4 = x^2$

$0 = x^2 - 3x - 4$

$0 = (x-4)(x+1)$

$x = 4, -1$

$\sqrt{16} = 4$ $\quad$ $\sqrt{-3+4} = -1$

$4 = 4$ ✓ $\quad$ $1 \neq -1$

extraneous

(d) $\sqrt{4x-19} - 2 = 5$

$\sqrt{4x-19} = 7$

$4x-19 = 49$

$4x = 68$

$x = 17$

$\sqrt{4(17)-19} - 2 = 5$

$\sqrt{49} = 7$

$7 = 7$ ✓

$4\overline{)68}$ $\quad$ 17

-4

28

Example 3. Some Examples to Look Out For
Solve and check for extraneous solutions.

(a) $\sqrt{x-15} - \sqrt{x-7} = 0$

$\sqrt{x-15} = \sqrt{x-7}$

$x-15 = x-7$

$0 \neq 8$

No solution

(b) $x+3 = \sqrt{2x+21}$

$(x+3)^2 = 2x+21$

$x^2+6x+9 = 2x+21$

$x^2+4x-12 = 0$

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

$x = 2, -6$

$2+3 = \sqrt{4+21}$ $\quad$ $-3 = \sqrt{-12+21}$

$5 = \sqrt{25}$ $\quad$ $-3 \neq 3$

$5 = 5$ ✓ $\quad$ extraneous

Homework:

New: Pg. 732 #14-27

Review:
Solve.

1. $2\sqrt{x} - 8 = 0$

$2\sqrt{x} = 8$

$\sqrt{x} = 4$

$x = 16$

2. $\sqrt{x+5} + 7 = 12$

$\sqrt{x+5} = 5$

$x+5 = 25$

$x = 20$

3. $4\sqrt{x-7} + 12 = 28$

$4\sqrt{x-7} = 16$

$x-7 = 16$

$x = 23$