Sec. 10.4 Solving Radical Equations

extraneous solution: an apparent solution that does not satisfy the original equation.

Problem 1: Solve.

a. $\sqrt{x} + 11 = 21$

$-11 \quad -11$

$(\sqrt{x})^2 = (10)^2$

$x = 100$

b. $\sqrt{x} - 5 = -2$

$+5 \quad +5$

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

$x = 9$

c. $\left(\sqrt{3m-6}\right)^2 = \left(\sqrt{m+23}\right)^2$

$3m - 6 = m + 23$

$-m \quad -m$

$2m - 6 = 23$

$+6 \quad +6$

$\frac{2m}{2} = \frac{29}{2}$

$\boxed{m = \frac{29}{2}}$

d. $\left(\sqrt{7x-4}\right)^2 = \left(\sqrt{5x+10}\right)^2$

$7x - 4 = 5x + 10$

$-5x \quad -5x$

$2x - 4 = 10$

$+4 \quad +4$

$\frac{2x}{2} = \frac{14}{2}$

$\boxed{x = 7}$

e. $(x)^2 = (\sqrt{-x+6})^2$

$x^2 = -x + 6$

$+x \quad -6 \quad +x \quad -6$

$x^2 + x - 6 = 0$

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

$x = -3, 2$

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

$-3 = \sqrt{9}$

$-3 = 3$

f. $(-y)^2 = (\sqrt{y+6})^2$

$y^2 = y + 6$

$-y \quad -6 \quad -y \quad -6$

$y^2 - y - 6 = 0$

$(y-3)(y+2) = 0$

$y = 3, -2$

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

$-3 = \sqrt{9}$

$-3 \neq 3$

$2 = \sqrt{2+6}$

$2 = \sqrt{4}$ ✓

g. $\sqrt{4r} + 7 = 3$

$-7 \quad -7$

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

$4r = 16$

$\frac{4r}{4} = \frac{16}{4}$

$r = 4$ extraneous solution

$\sqrt{16} + 7 = 3$

$4 + 7 = 3$

$11 \neq 3$

no solution

h. $6 - \sqrt{2x} = 10$

$-6 \quad -6$

$(-\sqrt{2x})^2 = (4)^2$ no sol.

$\frac{2x}{2} = \frac{16}{2}$

$x = 8$

$6 - \sqrt{2 \cdot 8} = 10$

$6 - \sqrt{16}$

$6 - 4 \neq 10$

Problem 2: The velocity of a projectile is determined by the function $V = \sqrt{\frac{s}{0.03}}$, where s is the horizontal distance in meters traveled by the projectile. If the velocity of a projectile is measured at 150 m/s, what is the distance the projectile travels?

$V = \sqrt{\frac{s}{0.03}} \qquad (150)^2 = \left(\sqrt{\frac{s}{0.03}}\right)^2$

$0.03 \cdot 22500 = \frac{s}{0.03} \cdot 0.03$

$675 = s$

675 meters