8.8- Solving Radical Equations and Inequalities

Principle of Powers

If $a = b$ and n is a positive integer, then $a^n = b^n$

Solve $\quad \dfrac{3\sqrt{2x-1}}{3} = \dfrac{6}{3}$ $\quad$ Check your solution.

$$\left(\sqrt{2x-1}\right)^2 = (2)^2$$

$$2x - 1 = 4$$
$$\underline{+1 \quad +1}$$
$$2x = 5$$
$$\frac{2x}{2} = \frac{5}{2}$$
$$x = \frac{5}{2}$$

Solve $\left(\sqrt{x+2}\right)^2 = \left(\sqrt{5-2x}\right)^2$ Check your solution.

$$
\begin{array}{rcl}
x+2 & = & 5-2x \\
+2x \quad -2 & & -2 \quad +2x \\
\hline
3x & = & 3 \\
\hline
\overline{3} & & \overline{3}
\end{array}
$$

$$x = 1$$

Solve $\left(\sqrt{x-1}\right)^2 = \left(-x+2\right)^2$ Check your solution.

$$x-1 = (-x+2)(-x+2)$$

$$x-1 = x^2-4x+4$$

$$-x+1 \qquad -x+1$$

$$x^2-5x+5=0$$

$a=1$
$b=-5$
$c=5$

$$x = \frac{5 \pm \sqrt{(-5)^2-4(1)(5)}}{2(1)}$$

$$x = \frac{5 \pm \sqrt{5}}{2}$$

$$x = \cancel{3.62}, 1.38$$

Solve $3\sqrt{x}+2=\sqrt{3x}$ Check your solution.

$$-\sqrt{3x} \qquad -\sqrt{3x}$$

$$3\sqrt{x}-\sqrt{3x}+2=0$$

$$-2 \qquad -2$$

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

$$\left(3\sqrt{x}-\sqrt{3x}\right)\left(3\sqrt{x}-\sqrt{3x}\right)=4$$

$$9x-3x\sqrt{3}-3x\sqrt{3}+3x=4$$

$$12x-6x\sqrt{3}=4$$

$$x\left(12-6\sqrt{3}\right)=4$$

$$\overline{12-6\sqrt{3}} \qquad \overline{12-6\sqrt{3}}$$

$$x=\frac{4}{12-6\sqrt{3}}=\frac{2}{6-3\sqrt{3}}\approx 2.49$$

Solve $\left(\sqrt{2x-3}\right)^2 < 5^2$ Check your solution.

$2x-3 \geq 0$ AND $2x-3 < 25$

$\quad +3 \quad +3 \qquad\qquad +3 \quad +3$

$\dfrac{2x}{2} \geq \dfrac{3}{2} \qquad\qquad \dfrac{2x}{2} < \dfrac{28}{2}$

$x \geq 3/2 \qquad\qquad x < 14$

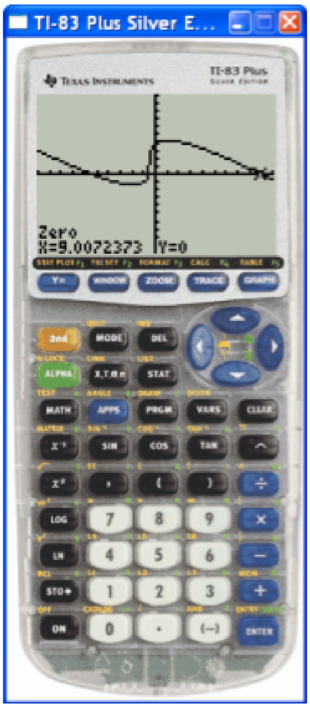
$x \geq \frac{3}{2}$ AND $x < 14$

$\frac{3}{2} \leq x < 14$

Solve $x-1<3\sqrt[3]{2x+1}$ by graphing. Give the solution to the nearest tenth.

$-x+1 \qquad -x+1$

$3\sqrt[3]{2x+1}-x+1>0$



$x<-5.4$ OR

$-.6<x<9$

Homework

Pg. 542-543 #20-28 even, 38-44 even, 62, 63

20) $\left(\sqrt[3]{2x-3}\right)^3 = \left(\sqrt[3]{2-x}\right)^3$

$$2x - 3 = 2 - x$$
$$+x \quad +3 \quad +3 \quad +x$$

$$3x = 5$$
$$\frac{3x}{3} = \frac{5}{3}$$

$$x = \frac{5}{3}$$

22) $3\sqrt{2x+1} = 2\sqrt{2x} - 1$

$$-2\sqrt{2x} \qquad -2\sqrt{2x}$$

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

No Solution

24) $\left(\sqrt{3x+2}\right)^2 = (x-2)^2$

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

$$3x+2 = x^2-4x+4$$
$$-3x-2 \qquad -3x-2$$

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

$a=1$
$b=-7$
$c=2$

$$x = \frac{7 \pm \sqrt{(-7)^2-4(1)(2)}}{2(1)}$$

$$x = \frac{7 \pm \sqrt{41}}{2}$$

$$x = \frac{7+\sqrt{41}}{2}$$

26) $\left(\sqrt{3x+4}\right)^2 \geq 2^2$

$3x+4 \geq 0$ AND $3x+4 \geq 4$

$-4 \quad -4$ $\qquad$ $-4 \quad -4$

$\frac{3x}{3} \geq \frac{-4}{3}$ $\qquad$ $\frac{3x}{3} \geq \frac{0}{3}$

$x \geq -\frac{4}{3}$ AND $x \geq 0$

$x \geq 0$

28) $\left(\sqrt{3x+4}\right)^2 \le 2^2$

$3x+4 \ge 0$ AND $3x+4 \le 4$

$$\frac{3x}{3} \ge \frac{-4}{3} \qquad \frac{3x}{3} \le \frac{0}{3}$$

$x \ge -\frac{4}{3}$ AND $x \le 0$

$-\frac{4}{3} \le x \le 0$

38) $\frac{1}{8} \le x \le \sqrt{x}$

$\frac{1}{8} \le x$ AND $x^2 \le \sqrt{x}^2$

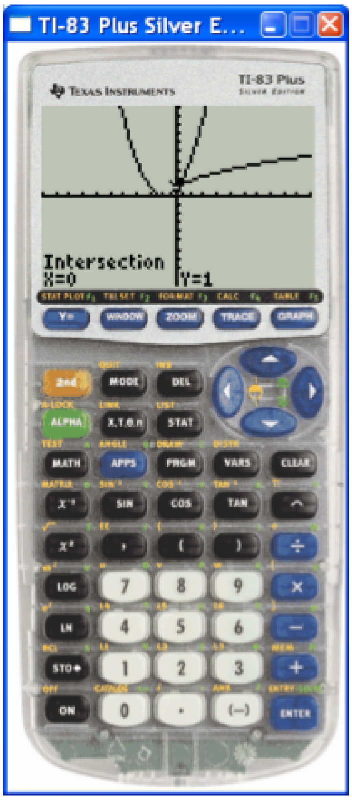
$\frac{x^2}{x} \le \frac{x}{x}$

$x \le 1$

$\frac{1}{8} \le x \le 1$

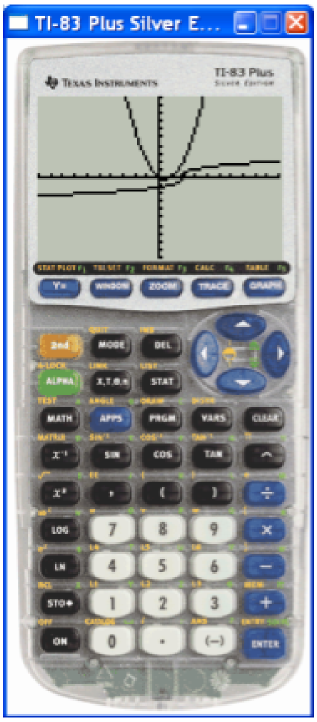
40) $(x+1)^2 = \sqrt{2x+1}$

$x = 0$



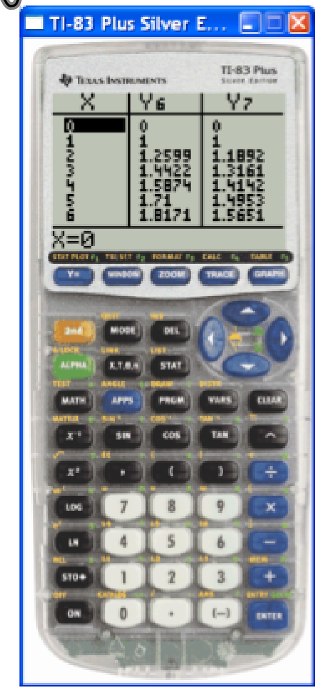
42) $x^2 - x = \sqrt[3]{x-2}$

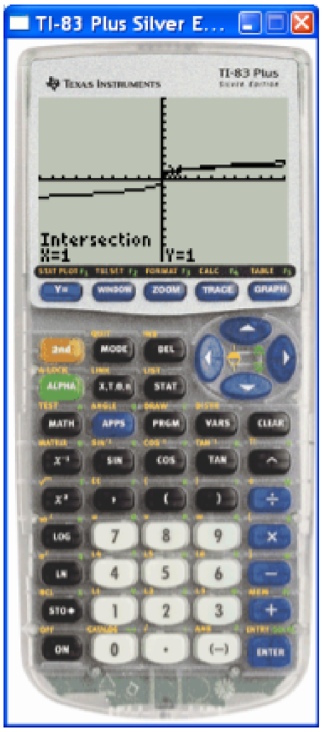
No Solution



44) $\sqrt[3]{x} = \sqrt[4]{x}$

$x = 0, 1$





62) $h(T) = -16T^2 + 128T + 50$

$$T = -16h^2 + 128h + 50$$

$$-16h^2 + 128h + 50 - T$$

$a = -16$

$b = 128$

$c = 50 - T$

$$h = \frac{-128 \pm \sqrt{128^2 - 4(-16)(50-T)}}{2(-16)}$$

$$= \frac{-128 \pm \sqrt{19584 - 64T}}{-32}$$

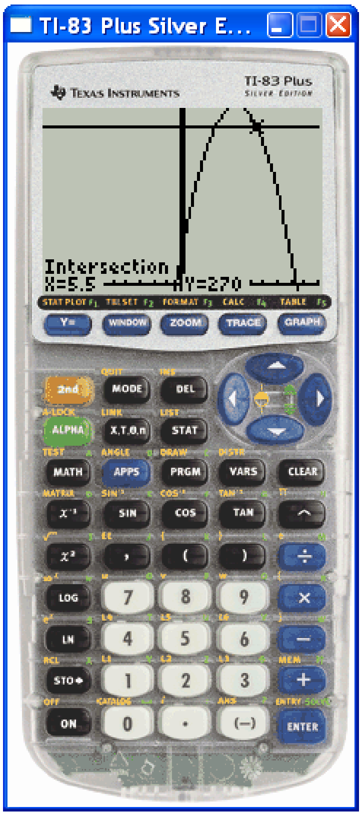
$$= 4 \pm \frac{8\sqrt{306-T}}{-32}$$

$$\therefore h = 4 \pm \frac{\sqrt{306-T}}{4}$$

c) $T = 2.5$ sec.

+

5.5 sec.



63) $d = 6397.2\sqrt{h}$

a) $6397.2\sqrt{900} = 191916 \text{ ft.}$

b) $191916\,\cancel{\text{ft}} \cdot \dfrac{1 \text{ mi}}{5280\,\cancel{\text{ft}}}$

$= 36.3 \text{ mi}$

c) $\dfrac{6397.2\sqrt{h}}{6397.2} = \dfrac{168960 \text{ ft.}}{6397.2}$

$(\sqrt{h})^2 = (26.411)^2$

$h = 698 \text{ ft.}$