

section 8.6

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$$288) \sqrt{4x-3} = 7$$

$$(\sqrt{4x-3})^2 = (7)^2$$

$$\begin{array}{r} 4x-3 = 49 \\ +3 \quad +3 \end{array}$$

$$\begin{array}{r} 4x = 52 \\ \hline 4 \quad 4 \end{array}$$

$$x = 13$$

quick check

$$\sqrt{4(13)-3} = \sqrt{52-3} = \sqrt{49} = 7$$

inside even radical is
not negative

$$\boxed{x = 13}$$

$$290) \sqrt{3y-4} = -2$$

$$(\sqrt{3y-4})^2 = (-2)^2$$

$$\begin{array}{r} 3y-4 = 4 \\ +4 \quad +4 \end{array}$$

$$\begin{array}{r} 3y = 8 \\ \hline 3 \quad 3 \end{array}$$

$$y = \frac{8}{3}$$

quick check

$$\sqrt{3(\frac{8}{3})-4} = \sqrt{8-4} = \sqrt{4} = 2 \neq -2$$

discard

$$\boxed{\text{no solution}}$$

$$292) \sqrt[3]{4x-1} = 3$$

$$(\sqrt[3]{4x-1})^3 = (3)^3$$

$$\begin{array}{r} 4x-1 = 27 \\ +1 \quad +1 \end{array}$$

$$\begin{array}{r} 4x = 28 \\ \hline 4 \quad 4 \end{array}$$

$$x = 7$$

quick check

odd root

$$\boxed{x = 7}$$

$$294) \sqrt{2n-1} - 3 = 0$$

$$\begin{array}{r} +3 \quad +3 \\ \hline \sqrt{2n-1} = 3 \end{array}$$

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

$$\begin{array}{r} 2n-1 = 9 \\ +1 \quad +1 \\ \hline \end{array}$$

$$\frac{2n}{2} = \frac{10}{2}$$

$$n = 5$$

quick check

$$\sqrt{2(5)-1} = \sqrt{9} = 3$$

$$\boxed{n=5}$$

$$296) \sqrt{12u+1} - 11 = 0$$

$$\begin{array}{r} +11 \quad +11 \\ \hline \sqrt{12u+1} = 11 \end{array}$$

$$(\sqrt{12u+1})^2 = (11)^2$$

$$\begin{array}{r} 12u+1 = 121 \\ -1 \quad -1 \\ \hline \end{array}$$

$$\frac{12u}{12} = \frac{120}{12}$$

$$u = 10$$

quick check

$$\sqrt{12(10)+1} = \sqrt{121}$$

$$\boxed{u=10}$$

$$298) \sqrt{6n+1} + 4 = 8$$

$$\begin{array}{r} -4 \quad -4 \\ \hline \sqrt{6n+1} = 4 \end{array}$$

$$(\sqrt{6n+1})^2 = (4)^2$$

$$\begin{array}{r} 6n+1 = 16 \\ -1 \quad -1 \\ \hline \end{array}$$

$$\frac{6n}{6} = \frac{15}{6}$$

$$\boxed{n = \frac{5}{3}}$$

quick check

$$\sqrt{6\left(\frac{5}{3}\right)+1} + 4$$

$$\sqrt{15+1} + 4$$

$$\sqrt{16} + 4$$

$$300) \sqrt{5v-2} + 5 = 0$$

$$\begin{array}{r} -5 \quad -5 \\ \hline \end{array}$$

$$\sqrt{5v-2} = -5$$

$$(\sqrt{5v-2})^2 = (-5)^2$$

$$\begin{array}{r} 5v-2 = 25 \\ +2 \quad +2 \\ \hline \end{array}$$

$$\frac{5v}{5} = \frac{27}{5}$$

$$v = \frac{27}{5}$$

quick check

$$\sqrt{5\left(\frac{27}{5}\right)-2} + 5$$

$$\sqrt{27-2} + 5$$

$$\sqrt{25} + 5$$

$$5 + 5 = 10 \neq 0$$

discard

no solution

$$302) \sqrt{v-10} + 10 = v$$

$$\begin{array}{r} -10 \quad -10 \\ \hline \end{array}$$

$$\sqrt{v-10} = v-10$$

$$(\sqrt{v-10})^2 = (v-10)^2$$

$$v-10 = v^2-20v+100$$

$$\begin{array}{r} -v+10 \quad -v+10 \\ \hline \end{array}$$

$$0 = v^2 - 21v + 110$$

$$0 = (v-10)(v-11)$$

$$v-10=0$$

$$+10+10$$

$$v=10$$

quick check

$$\sqrt{(10)-10} + 10 \stackrel{?}{=} (10)$$

$$0 + 10 = 10$$

$$10 \checkmark = 10$$

$$v-11=0$$

$$+11+11$$

$$v=11$$

quick check

$$\sqrt{(11)-10} + 10 \stackrel{?}{=} (11)$$

$$\sqrt{1} + 10 = 11$$

$$11 \checkmark = 11$$

$$v=10, v=11$$

$$304) \sqrt{x-8} = x-8$$

$$(\sqrt{x-8})^2 = (x-8)^2$$

$$\begin{array}{r} x-8 = x^2-16x+64 \\ -x+8 \quad \quad -x+8 \\ \hline \end{array}$$

$$0 = x^2 - 17x + 72$$

$$0 = (x-8)(x-9)$$

$$x-8=0$$

$$+8+8$$

$$x=8$$

quick check

$$\sqrt{(8)-8} \stackrel{?}{=} (8)-8$$

$$0 \stackrel{?}{=} 0$$

$$x-9=0$$

$$+9+9$$

$$x=9$$

quick check

$$\sqrt{(9)-8} \stackrel{?}{=} (9)-8$$

$$1 \stackrel{?}{=} 1$$

$$\boxed{x=8, x=9}$$

$$306) \sqrt[3]{11x+4} = 5$$

$$(\sqrt[3]{11x+4})^3 = (5)^3$$

$$\begin{array}{r} 11x+4 = 125 \\ -4 \quad -4 \\ \hline \end{array}$$

$$\begin{array}{r} 11x = 121 \\ 11 \quad 11 \\ \hline \end{array}$$

$$x=11$$

quick check

$$\sqrt[3]{11(11)+4} = \sqrt[3]{121+4} = \sqrt[3]{125} = 5$$

$$\boxed{x=11}$$

$$308) \sqrt[3]{9x-1} - 1 = -5$$

$$+1 \quad +1$$

$$\sqrt[3]{9x-1} = -4$$

$$(\sqrt[3]{9x-1})^3 = (-4)^3$$

$$9x-1 = -64$$

$$+1 \quad +1$$

$$\begin{array}{r} 9x = -63 \\ 9 \quad 9 \\ \hline \end{array}$$

$$x = -7$$

quick check

$$\sqrt[3]{9(-7)-1} - 1$$

$$\sqrt[3]{-63-1} - 1$$

$$\sqrt[3]{-64} - 1$$

$$-4 - 1 = -5$$

$$\boxed{x=-7}$$

$$310) (3x-2)^{\frac{1}{2}} + 1 = 6$$

$$\begin{array}{r} \sqrt{3x-2} + 1 = 6 \\ -1 \quad -1 \\ \hline \end{array}$$

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

$$(\sqrt{3x-2})^2 = (5)^2$$

$$3x-2 = 25$$

$$\begin{array}{r} +2 \quad +2 \\ \hline \end{array}$$

$$\begin{array}{r} 3x = 27 \\ \hline 3 \quad 3 \end{array}$$

$$x = 9$$

quick check

$$\sqrt{3(9)-2} + 1$$

$$\sqrt{27-2} + 1$$

$$\sqrt{25} + 1$$

$$5 + 1 = 6$$

$$\boxed{x = 9}$$

$$312) (12x-5)^{\frac{1}{3}} + 8 = 3$$

$$\begin{array}{r} \sqrt[3]{12x-5} + 8 = 3 \\ -8 \quad -8 \\ \hline \end{array}$$

$$\sqrt[3]{12x-5} = -5$$

$$(\sqrt[3]{12x-5})^3 = (-5)^3$$

$$12x-5 = -125$$

$$\begin{array}{r} +5 \quad +5 \\ \hline \end{array}$$

$$\begin{array}{r} 12x = -120 \\ \hline 12 \quad 12 \end{array}$$

$$x = -10$$

quick check

$$\sqrt[3]{12(-10)-5} + 8$$

$$\sqrt[3]{-120-5} + 8$$

$$\sqrt[3]{-125} + 8$$

$$-5 + 8 = 3$$

$$\boxed{x = -10}$$

$$314) (5x - 4)^{\frac{1}{4}} + 7 = 9$$

$$\begin{array}{r} \sqrt[4]{5x-4} + 7 = 9 \\ -7 \quad -7 \\ \hline \end{array}$$

$$\sqrt[4]{5x-4} = 2$$

$$(\sqrt[4]{5x-4})^4 = (2)^4$$

$$\begin{array}{r} 5x - 4 = 16 \\ +4 \quad +4 \\ \hline \end{array}$$

$$\begin{array}{r} 5x = 20 \\ \frac{5}{5} \quad \frac{20}{5} \\ \hline x = 4 \end{array}$$

quick check

$$\sqrt[4]{5(4)-4} + 7$$

$$\sqrt[4]{20-4} + 7$$

$$\sqrt[4]{16} + 7$$

$$2 + 7 = 9$$

$$\boxed{x = 4}$$

$$316) \sqrt{y+4} - y + 2 = 0$$

$$\begin{array}{r} \sqrt{y+4} - y + 2 = 0 \\ +y - 2 \quad +y - 2 \\ \hline \end{array}$$

$$\sqrt{y+4} = y - 2$$

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

$$\begin{array}{r} y + 4 = y^2 - 4y + 4 \\ -y - 4 \quad -y - 4 \\ \hline \end{array}$$

$$0 = y^2 - 5y$$

$$0 = y(y-5)$$

$$y = 0$$

quick check

$$\sqrt{(0)+4} - (0) + 2$$

$$\sqrt{4} + 2$$

$$2 + 2 = 4 \neq 0$$

discard

$$\boxed{y = 5}$$

$$\begin{array}{r} y - 5 = 0 \\ +5 +5 \\ \hline y = 5 \end{array}$$

quick check

$$\sqrt{(5)+4} - (5) + 2$$

$$\sqrt{9} - 5 + 2$$

$$3 - 5 + 2 = 0$$

$$318) \sqrt{w+25} - w = -5$$

$$\begin{array}{r} +w \quad +w \\ \hline \end{array}$$

$$\sqrt{w+25} = w-5$$

$$(\sqrt{w+25})^2 = (w-5)^2$$

$$\begin{array}{r} w+25 = w^2-10w+25 \\ -w \quad -25 \quad \quad -w \quad -25 \\ \hline \end{array}$$

$$0 = w^2 - 11w$$

$$0 = w(w-11)$$

$$w=0$$

quick check

$$\sqrt{(0)+25} - (0)$$

$$5 - 0$$

$$5 \neq -5$$

discard

$$\boxed{w=11}$$

$$w-11=0$$

$$+11 \quad +11$$

$$w=11$$

quick check

$$\sqrt{(11)+25} - 11$$

$$\sqrt{36} - 11$$

$$6 - 11 = -5$$

$$320) 2\sqrt{5x+1} - 8 = 0$$

$$\begin{array}{r} +8 \quad +8 \\ \hline \end{array}$$

$$\frac{2\sqrt{5x+1}}{2} = \frac{8}{2}$$

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

$$(\sqrt{5x+1})^2 = (4)^2$$

$$5x+1 = 16$$

$$\begin{array}{r} -1 \quad -1 \\ \hline \end{array}$$

$$\frac{5x=15}{5 \quad 5}$$

$$x=3$$

quick check

$$2\sqrt{5(3)+1} - 8$$

$$2\sqrt{15+1} - 8$$

$$2\sqrt{16} - 8$$

$$2(4) - 8$$

$$8 - 8 = 0$$

$$\boxed{x=3}$$

$$322) \quad 3\sqrt{7y+1} - 10 = 8$$

$$+10 \quad +10$$

$$\frac{3\sqrt{7y+1}}{3} = \frac{18}{3}$$

$$\sqrt{7y+1} = 6$$

$$(\sqrt{7y+1})^2 = (6)^2$$

$$7y+1 = 36$$

$$-1 \quad -1$$

$$\frac{7y}{7} = \frac{35}{7}$$

$$y = 5$$

quick check

$$3\sqrt{7(5)+1} - 10$$

$$3\sqrt{35+1} - 10$$

$$3\sqrt{36} - 10$$

$$3(6) - 10$$

$$18 - 10 = 8$$

$$\boxed{y = 5}$$

quick check

$$\sqrt{4(2)+1} = \sqrt{8+1} = \sqrt{9} = 3$$

$$\sqrt{3(2)+3} = \sqrt{6+3} = \sqrt{9} = 3$$

$$\boxed{x = 2}$$

$$324) \quad \sqrt{4x+1} = \sqrt{3x+3}$$

$$(\sqrt{4x+1})^2 = (\sqrt{3x+3})^2$$

$$4x+1 = 3x+3$$

$$-3x \quad -1 \quad -3x \quad -1$$

$$x = 2$$

$$326) \sqrt{10+2c} = \sqrt{4c+16}$$

$$(\sqrt{10+2c})^2 = (\sqrt{4c+16})^2$$

$$\begin{array}{r} 10+2c = 4c+16 \\ -16 \quad -2c \quad -2c \quad -16 \\ \hline \end{array}$$

$$\frac{-6}{2} = \frac{2c}{2}$$

$$-3 = c$$

quick check

$$\sqrt{10-2(-3)} = \sqrt{10-6} = \sqrt{4} = 2$$

$$\sqrt{4(-3)+16} = \sqrt{-12+16} = \sqrt{4} = 2$$

$$\boxed{c = -3}$$

$$328) \sqrt[3]{8x-5} = \sqrt[3]{3x+5}$$

$$(\sqrt[3]{8x-5})^3 = (\sqrt[3]{3x+5})^3$$

$$\begin{array}{r} 8x-5 = 3x+5 \\ -3x \quad +5 \quad -3x \quad +5 \\ \hline \end{array}$$

$$\frac{5x}{5} = \frac{10}{5}$$

$$x = 2$$

quick check

$$\sqrt[3]{8(2)-5} = \sqrt[3]{16-5} = \sqrt[3]{11}$$

$$\sqrt[3]{3(2)+5} = \sqrt[3]{6+5} = \sqrt[3]{11}$$

$$\boxed{x = 2}$$

$$330) \sqrt[3]{x^2 - x + 18} = \sqrt[3]{2x^2 - 3x - 6} \quad \begin{array}{l} x+4=0 \\ -4-4 \end{array}$$

$$\left(\sqrt[3]{x^2 - x + 18}\right)^3 = \left(\sqrt[3]{2x^2 - 3x - 6}\right)^3$$

$$\begin{array}{r} x^2 - x + 18 = 2x^2 - 3x - 6 \\ -x^2 + x - 18 = -x^2 + x - 18 \end{array}$$

$$0 = x^2 - 2x - 24$$

$$0 = (x+4)(x-6)$$

$$\boxed{x = -4, x = 6}$$

$$x = -4$$

quick check

$$\sqrt[3]{(-4)^2 - (-4) + 18} = \sqrt[3]{16 + 4 + 18} = \sqrt[3]{38}$$

$$\sqrt[3]{2(-4)^2 - 3(-4) - 6} = \sqrt[3]{32 + 12 - 6} = \sqrt[3]{38}$$

$$x - 6 = 0$$

$$+6 + 6$$

$$x = 6$$

quick check

$$\sqrt[3]{(6)^2 - (6) + 18} = \sqrt[3]{36 - 6 + 18} = \sqrt[3]{48}$$

$$\sqrt[3]{2(6)^2 - 3(6) - 6} = \sqrt[3]{72 - 18 - 6} = \sqrt[3]{48}$$

extra knowledge 331 - 342

$$332) \sqrt{x} + 6 = \sqrt{x+8}$$

$$(\sqrt{x} + 6)^2 = (\sqrt{x+8})^2$$

$$\begin{array}{r} x + 12\sqrt{x} + 36 = x + 8 \\ -x \quad -36 \quad -x \quad -36 \end{array}$$

$$\frac{12\sqrt{x}}{12} = \frac{-28}{12}$$

$$\sqrt{x} = \frac{-7}{3}$$

$$(\sqrt{x})^2 = \left(\frac{-7}{3}\right)^2$$

$$x = \frac{49}{9}$$

quick check

$$\sqrt{\left(\frac{49}{9}\right)} + 6 = \frac{7}{3} + 6 = \frac{7}{3} + \frac{18}{3} = \frac{25}{3}$$

$$\sqrt{\left(\frac{49}{9}\right) + 8} = \sqrt{\frac{49}{9} + \frac{72}{9}} = \sqrt{\frac{121}{9}} = \frac{11}{3}$$

discard

$\boxed{\text{no solution}}$

$$334) \sqrt{x} + 1 = \sqrt{x+2}$$

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

$$\begin{array}{r} x+2 \quad \sqrt{x}+1 = x+2 \\ -x \quad \quad -1 \quad -x \quad -1 \\ \hline \end{array}$$

$$\frac{2\sqrt{x}}{2} = \frac{1}{2}$$

$$\sqrt{x} = \frac{1}{2}$$

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

$$x = \frac{1}{4}$$

quick check

$$\sqrt{\left(\frac{1}{4}\right)} + 1 = \frac{1}{2} + 1 = \frac{1}{2} + \frac{2}{2} = \frac{3}{2}$$

$$\sqrt{\left(\frac{1}{4}\right)+2} = \sqrt{\frac{1}{4} + \frac{8}{4}} = \sqrt{\frac{9}{4}} = \frac{3}{2}$$

$$\boxed{x = \frac{1}{4}}$$

$$336) \begin{array}{r} -2 = \sqrt{d-20} - \sqrt{d} \\ +\sqrt{d} \quad \quad +\sqrt{d} \\ \hline \end{array}$$

$$\sqrt{d} - 2 = \sqrt{d-20}$$

$$(\sqrt{d} - 2)^2 = (\sqrt{d-20})^2$$

$$\begin{array}{r} d - 4\sqrt{d} + 4 = d - 20 \\ -d \quad \quad -4 \quad -d \quad -4 \\ \hline \end{array}$$

$$\begin{array}{r} -4\sqrt{d} = -24 \\ -4 \quad \quad -4 \\ \hline \end{array}$$

$$\sqrt{d} = 6$$

$$(\sqrt{d})^2 = (6)^2$$

$$d = 36$$

quick check

$$\sqrt{(36)-20} - \sqrt{36}$$

$$\sqrt{16} - \sqrt{36}$$

$$4 - 6 = -2$$

$$\boxed{d = 36}$$

$$338) \sqrt{3x+1} = 1 + \sqrt{2x-1}$$

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

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

$$\begin{array}{r} 3x+1 = 2\sqrt{2x-1} + 2x \\ -2x \qquad \qquad -2x \\ \hline \end{array}$$

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

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

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

$$\frac{x^2+2x+1}{4} = 2x-1$$

LCD = 4

$$\left(\frac{4}{1}\right)\left(\frac{x^2+2x+1}{4}\right) = \left(\frac{2x-1}{1}\right)\left(\frac{4}{1}\right)$$

$$x^2+2x+1 = 8x-4$$

$$\begin{array}{r} -8x+4 \quad -8x+4 \\ \hline \end{array}$$

$$x^2-6x+5=0$$

$$(x-1)(x-5)=0$$

$$\begin{array}{r} x-1=0 \\ +1 \quad +1 \\ \hline x=1 \end{array}$$

quick check

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

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

$$\begin{array}{r} x-5=0 \\ +5 \quad +5 \\ \hline x=5 \end{array}$$

quick check

$$\sqrt{3(5)+1} = \sqrt{15+1} = \sqrt{16} = 4$$

$$1 + \sqrt{2(5)-1} = 1 + \sqrt{10-1} = 1 + \sqrt{9} = 1 + 3 = 4$$

$$\boxed{x=1, x=5}$$

$$346) \quad \begin{array}{r} \sqrt{x+1} - \sqrt{x-2} = 1 \\ + \sqrt{x-2} \quad + \sqrt{x-2} \end{array}$$

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

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

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

$$\begin{array}{r} x+1 = 2\sqrt{x-2} + x-1 \\ -x+1 \quad \quad -x+1 \end{array}$$

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

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

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

$$\begin{array}{r} 1 = x-2 \\ +2 \quad \quad +2 \end{array}$$

$$3 = x$$

quick check

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

$$\sqrt{4} - \sqrt{1}$$

$$2 - 1 = 1$$

$x = 3$

$$342) \sqrt{x+5} - \sqrt{x-3} = 2$$

$$\begin{array}{r} + \sqrt{x-3} \quad + \sqrt{x-3} \\ \hline \end{array}$$

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

$$(\sqrt{x+5})^2 = (2 + \sqrt{x-3})^2$$

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

$$\begin{array}{r} x+5 = 4\sqrt{x-3} + x+1 \\ -x-1 \quad -x-1 \\ \hline \end{array}$$

$$\begin{array}{r} 4 = 4\sqrt{x-3} \\ \hline 4 \quad 4 \end{array}$$

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

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

$$\begin{array}{r} 1 = x-3 \\ +3 \quad +3 \\ \hline 4 = x \end{array}$$

quick check

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

$$\sqrt{9} - \sqrt{1}$$

$$3 - 1 = 2$$

$$\boxed{x=4}$$