1.6 Other types of Equations pg. 136 35-56

Solving with radicals * $\sqrt{x}$ Domain: $x \geq 0$

① $2\sqrt{4x} - 3 = 9$

$+3 \quad +3$

$\frac{2\sqrt{4x}}{2} = \frac{12}{2}$

$\sqrt{4x} = 6$ ← isolated the radical

$(\sqrt{4x})^2 = 6^2$ ← square both sides to eliminate radicals

$\frac{4x}{4} = \frac{36}{4}$

$\boxed{x = 9}$

Leave the variable inside the radical until you isolate the radical

Check answer for extraneous solutions

Domain issue: $\sqrt{4x}$

$4x \geq 0$

$x \geq 0$

$9 \geq 0$ ✓ $\boxed{x = 9}$

② $4 + \sqrt[3]{x+1} = 6$

$-4 \quad -4$

$\sqrt[3]{x+1} = 2$

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

$x + 1 = 8$

$\boxed{x = 7}$

✓ Domain: $\sqrt{x+1}$

$x + 1 \geq 0$

$x \geq -1$

$7 \geq -1$ ✓

$\boxed{x = 7}$

③ $\sqrt{3x-2}+2=x$

$-2 \quad -2$

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

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

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

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

$-3x+2 \qquad -3x+2$

$0=x^2-7x+6$ ← When you get to a quadratic $ax^2+bx+c=0$ Solve by factoring or quadratic formula

$0=(x-6)(x-1)$

$x-6=0 \qquad x-1=0$

$\boxed{x=6} \qquad \boxed{x=1}$

Domain: $\sqrt{3x-2}$

$3x-2\geq 0$

$3x\geq 2$

$x\geq \frac{2}{3}$

✓ $6\geq\frac{2}{3}$ $1\geq\frac{2}{3}$ ✓ $\boxed{x=6}$ $\boxed{x=1}$

1.6 cont'd

Solve with two radicals

① $\sqrt{3x-4} - \sqrt{x+6} = 0$

$\sqrt{3x-4} = \sqrt{x+6}$ ← If you can isolate radicals on either side with no constant, squaring both sides eliminate both radicals

$(\sqrt{3x-4})^2 = (\sqrt{x+6})^2$

no constant

$3x-4 = x+6$

$-x+4 \quad -x+4$

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

$\boxed{x=5}$

Domain: $\sqrt{3x-4}$ $\quad$ $\sqrt{x+6}$

$3x-4 \geq 0$ $\quad$ $x+6 \geq 0$

$x \geq \frac{4}{3}$ $\quad$ $x \geq -6$

✓ $5 \geq \frac{4}{3}$ $\quad$ ✓ $5 \geq -6$

$\boxed{x=5}$

with a constant

TRY IT! Don't give up!

You can do it!

Knock down the walls!

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

$2\sqrt{x+1} = \sqrt{2x+3} + 1$ ← Get one on each side to simplify the process

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

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

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

$4x+4 = 2x+1 + 2\sqrt{2x+1} + 1$ ← Combine like terms

$4x+4 = 2x + 2 + 2\sqrt{2x+1}$

$-2x-2 \quad -2x-2$

$2x+2 = 2\sqrt{2x+1}$ ← Isolate the radical and square both sides

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

$4x^2 + 8x + 4 = 4(2x+1)$

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

$-8x-4 \quad -8x-4$

$\frac{4x^2}{4} = \frac{0}{4}$

$x^2 = 0$

$\boxed{x = 0}$

Domain $\sqrt{x+1}$ $\quad$ $\sqrt{2x+3}$

$x+1 \geq 0$ $\quad$ $2x+3 \geq 0$

$x \geq -1$ $\quad$ $x \geq -\frac{3}{2}$

✓ $0 \geq -1$ $\quad$ ✓ $0 \geq -\frac{3}{2}$

$\boxed{x = 0}$

☺ - Mags

1.6

Solve with Rational (fraction) Exponents

Note: $x^{\frac{1}{2}} = \sqrt{x}$ $\quad x^{\frac{1}{3}} = \sqrt[3]{x}$

$x^{\frac{2}{3}} = \left(\sqrt[3]{x}\right)^2$ $\quad x^{\frac{2}{3}} = \sqrt[3]{x^2}$ } Both are true

(1) $x^{\frac{3}{2}} = 64$

$\left(\sqrt[2]{x}\right)^3 = 64$ ← cube root both to cancel $(\ )^3$

$\left(\left(\sqrt{x}\right)^3\right)^{\frac{1}{3}} = 64^{\frac{1}{3}}$

$\sqrt{x} = \sqrt[3]{64}$

$\sqrt{x} = 4$

$\left(\sqrt{x}\right)^2 = 4^2$

$\boxed{x = 16}$

*no domain issues with exponential equations

(2) $(2x-1)^{\frac{2}{3}} = 9$

$\left((2x-1)^{\frac{2}{3}}\right)^{\frac{3}{2}} = 9^{\frac{3}{2}}$

$2x-1 = \left(\sqrt{9}\right)^3$

$2x-1 = 3^3$

$2x-1 = 27$

$2x = 28$

$\boxed{x = 14}$