Section 1.1

1. $A \cup B = \{-1, 1, 2, 3, 8, 9, 10, 101, 120\}$ $\quad A \cap B = \{3, 8, 101\}$

2. A. Integers $-7, 0, -\sqrt{100}$ $\quad$ B. Rational: $-7, 2/5, -0.7, 0, -\sqrt{100}$

C. Irrational: $\sqrt{7}, \pi$

3. a. $5-\sqrt{3}$ $\quad$ b. $\begin{cases} 2x-1 & \text{if } x \geq 1/2 \\ 1-2x & \text{if } x < 1/2 \end{cases}$

4. Either $+1$ or -1, assuming $x \neq -1/2$

5. a. $|x-1|$ $\quad$ b. $|x-1| > 5$

6. $|x| \leq 2$ all real numbers within or equal to 2 units from 0

$(-2, 2)$

7. $(-\infty, -1) \cup (1, 2]$ $\quad$ 8. $|x| > 3$

Section 1.2

1a. 1 $\quad$ b. $\frac{1}{5^2} = \frac{1}{25}$ $\quad$ c. $\frac{96y^{15}}{x^{10}}$ $\quad$ d. $\frac{9x^9}{16y^3}$ $\quad$ e. $\frac{3x}{y^2}$ $\quad$ f. $\frac{4x^4}{9y^2}$

2a. $5\sqrt{2}\,x^2$ $\quad$ b. $4x^2$ $\quad$ c. $\sqrt{7x}$ $\quad$ d. 15 $\quad$ e. $x\sqrt{y}$ $\quad$ f. Answers may vary. $6xy^3\sqrt[6]{(2xy)^5}$

g. $\frac{2x^3}{y}$

Section 1.3

1. a. -32 $\quad$ b. 192 $\quad$ c. $24x^2y^2$

2. a. $2x^3 - 11x^2 + 18x - 9$ $\quad$ b. $9x^2 - 12x + 4$ $\quad$ c. $4x - 4\sqrt{x} + 1$

d. $27x^3 - 108x^2 + 144x - 64$ $\quad$ e. $64y^2 - (7-3x)^2 = 64y^2 - 49 + 42x - 9x^2$

f. $(x-y)^2 - 3^2 = x^2 - 2xy + y^2 - 9$ $\quad$ g. $[(3x+1)(3x-1)](x^2+9) = (9x^2-1)(x^2+9)$

$= 9x^4 + 80x^2 - 9$

Section 1.4:

a. $12x^4 - 18x^3 - 54x^2 = 6x^2(2x^2 - 3x - 9) = 6x^2(2x+3)(x-3)$

b. $8x^2 + 33x + 4 = (8x+1)(x+4)$

c. $6x^4 + 6x^2 - 12 = 6(x^4 + x^2 - 2) = 6(x^2+2)(x^2-1) = 6(x^2+2)(x+1)(x-1)$

d. $16x^4 - 81 = (4x^2-9)(4x^2+9) = (2x+3)(2x-3)(4x^2+9)$

e. $(5x+2y)^2 - (5x-2y)^2 = ((5x+2y)+(5x-2y))((5x+2y)-(5x-2y))$

$= 10x(4y) = 40xy$

f. $125x^6 - 27 = (5x^2)^3 - 3^3 = (5x^2-3)(25x^4 + 15x^2 + 9)$

g. $2(x+3)^{1/2} - 10(x+3)^{5/2} = 2(x+3)^{1/2}(1 - 5(x+3)^2) = 2(x+3)^{1/2}(1 - 5(x^2+6x+9))$

$= 2(x+3)^{1/2}(1 - 5x^2 - 30x - 45)$

$= 2(x+3)^{1/2}(-5x^2 - 30x - 44) = -2(x+3)^{1/2}(5x^2 + 30x + 44)$

h. $3(x+1)(2x+3)^2 - 9(x+1)^2(2x+3) = 3(x+1)(2x+3)((2x+3) - 3(x+1))$

$= 3(x+1)(2x+3)(2x+3-3x-3) = -3x(x+1)(2x+3)$

i. $(x+1)^{1/3} + (x+1)^{-2/3} = (x+1)^{-2/3}(x+1+1) = (x+1)^{-2/3}(x+2) = \dfrac{x+2}{(x+1)^{2/3}}$

j. $2(x+3)^{-1/2} - 5(x+3)^{1/2} = (x+3)^{-1/2}(2 - 5(x+3)) = \dfrac{-5x-13}{\sqrt{x+3}}$

k. $(x^2-3)^2 - 4(x^2-3) + 3 = ([x^2-3]-3)([x^2-3]-1) = (x^2-6)(x^2-4)$

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

Section 1.5:

1 a. $\frac{1}{4}x + 1$ b. $\dfrac{10x + 3(5x+1)}{(5x+1)(5x)} = \dfrac{25x+3}{(5x+1)(5x)}$

c. $\dfrac{x^2-25}{x^2+3x-10} \div \dfrac{x^2+7x+10}{x^2+8x+15} = \dfrac{(x+5)(x-5)}{(x-2)(x-5)} \cdot \dfrac{(x+3)(x+5)}{(x+2)(x+5)}$

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

d. $\dfrac{x}{x-1}$

e. $\dfrac{3}{5x+2} + \dfrac{5x}{25x^2-4} = \dfrac{3(5x-2)+5x}{(5x+2)(5x-2)} = \dfrac{20x-6}{(5x+2)(5x-2)}$

f. $\dfrac{2(x+1)^{1/2} - x(x+1)^{-1/2}}{(x+1)} = \dfrac{(x+1)^{-1/2}\,(2(x+1)-x)}{(x+1)^1} = \dfrac{x+2}{(x+1)^{3/2}}$

g. $\left[\dfrac{\frac{3}{h+1} - 3}{h}\right]\dfrac{h+1}{h+1} = \dfrac{3-3(h+1)}{h(h+1)} = \dfrac{-3h}{h(h+1)} = \dfrac{-3}{h+1}$

h. $\left[\dfrac{\frac{1}{2+x} - \frac{1}{2}}{x}\right]\dfrac{2(2+x)}{2(2+x)} = \dfrac{2-(2+x)}{x(2)(2+x)} = \dfrac{-x}{x(2)(2+x)} = \dfrac{-1}{2(2+x)}$

i. $\dfrac{15x^4(x^2-1)^2 + 12x^2(x^2-1)^3}{x^4(x^2-1)(3x+2)} = \dfrac{3x^2(x^2-1)^2(5x^2+4(x^2-1))}{x^4(x^2-1)(3x+2)} = \dfrac{3x^2(x^2-1)^2(9x^2-4)}{x^4(x^2-1)(3x+2)}$

$= \dfrac{3\cancel{x^2}(x^2-1)^{\cancel{2}}(3x\cancel{+2})(3x-2)}{x^2\,\cancel{x^4}\,(\cancel{x^2-1})(\cancel{3x+2})} = \dfrac{3(3x-2)(x^2-1)}{x^2}$

j. $\dfrac{8x(x+2)^2 - 6x^2(x+2)}{6x^3(x+2)^6} = \dfrac{2x(x+2)[4(x+2)-3x]}{6x^3(x+2)^6} = \dfrac{2x(x+2)(x+8)}{6x^3(x+2)^6} = \dfrac{(x+8)}{3x^2(x+2)^5}$

k. $\dfrac{x-3}{x^2-4} - \dfrac{x+2}{x^2-4x+4} - \dfrac{2}{2-x} = \dfrac{x-3}{(x+2)(x-2)} - \dfrac{x+2}{(x-2)^2} + \dfrac{2}{(x-2)}$ LCD $= (x+2)(x-2)^2$

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

$= \dfrac{x^2-5x+6 - x^2-4x-4 + 2x^2-8}{(x+2)(x-2)^2} = \dfrac{2x^2-9x-6}{(x+2)(x-2)^2}$

2a. $\dfrac{23}{5+\sqrt{2}} \cdot \left(\dfrac{5-\sqrt{2}}{5-\sqrt{2}}\right) = \dfrac{23(5-\sqrt{2})}{5^2-2} = \boxed{5-\sqrt{2}}$

b. $\dfrac{\sqrt{x+3}-\sqrt{x}}{5} \cdot \left(\dfrac{\sqrt{x+3}+\sqrt{x}}{\sqrt{x+3}+\sqrt{x}}\right)$

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

Section 1.5

1a. $x=-8$ b. Solving gives $y=-1$. Checking indicates this is not a solution.

c. four solutions $x = 1, -1, \frac{1}{2\sqrt{2}}, \frac{-1}{2\sqrt{2}}$ d. $a=2$ Checking $a=-10$ shows you must discard $a=-10$.

e. $x=4$ f. $x=-1/2, 3$ g. $w=4, 9$ h. $y=-1,-7$ i. $c = \frac{-1 \pm \sqrt{41}}{4}$

j. $x = 1/4, 1$

2a. $6x^2-12x-3=0 \rightarrow 3x^2-6x-1=0 \rightarrow 3(x^2-2x)=1$

$\rightarrow 3(x-1)^2 = 1+3 \rightarrow 3(x-1)^2=4 \rightarrow (x-1)^2 = \frac{4}{3} \rightarrow x = 1 \pm \frac{2}{\sqrt{3}} = 1 \pm \frac{2\sqrt{3}}{3}$

b. $3x^2+x-2=0 \longrightarrow 3(x^2+\frac{1}{3}x)=2 \rightarrow 3(x+\frac{1}{6})^2 = 2+\frac{1}{12}$

$\rightarrow 3(x+\frac{1}{6})^2 = \frac{25}{12} \rightarrow (x+\frac{1}{6})^2 = \frac{25}{36}$ $x+\frac{1}{6} = \pm\frac{5}{6}$ $x=-1, 2/3$

Section 1.6 See book.

Section 1.7

1a. $x \geq -2$ b. $-2 \leq x < 2$ c. $0 < x < 8/3$ d. $[-2,-1) \cup [2,3)$

e. $[-2,0) \cup [2,\infty)$ f. $[0,\infty)$ g. $(-\infty,-3] \cup (0,1]$

2. $[-3,1) \cup (1,\infty)$

Section 1.8 + 1.10

1a. Symmetric about y-axis (Substitute $-x$ for x, y unchanged.)

b. " " origin odd fn (Substitute $-x$ for x, $-y$ for y, unchanged.)

c. Symmetric about the x-axis (Substitute $-y$ for y, unchanged.)

2a. $y=-x+3$ b. $m=1/2$ $y=\frac{1}{2}x+\frac{5}{2}$ c. $m=-2$ $y=2x+1$

3. $x=-1,7$ 4a. $(x-2)^2+(y-1)^2=9$ b. $(x-2)^2+(y+3)^2=17$

5. Center $(-5,9)$ radius 11.