

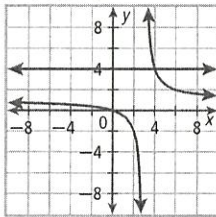
$$\begin{aligned}
 3. \quad 5 &= \frac{2}{2-c} + \frac{2}{2+c} \\
 5(4-c^2) &= \frac{2}{2-c}(4-c^2) + \frac{2}{2+c}(4-c^2) \\
 5(4-c^2) &= 2(2+c) + 2(2-c) \\
 20-5c^2 &= 8 \\
 -5c^2 &= -12 \\
 c &\approx \pm 1.5
 \end{aligned}$$

The average speed of the current is 1.5 mi/h.

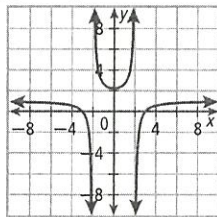
$$\begin{aligned}
 4. \quad \frac{1}{20}(11) + \frac{1}{h}(11) &= 1 \\
 \frac{1}{20}(11)(20h) + \frac{1}{h}(11)(20h) &= 1(20h) \\
 11h + 220 &= 20h \\
 220 &= 9h \\
 24 &\approx h
 \end{aligned}$$

It will take Remy about 24 min to mulch the garden when working alone.

5a. $3 < x \leq 4$



b. $x = -5$



6a. $\frac{6}{x-2} \geq -4$

LCD is positive.

$$\begin{aligned}
 \frac{6}{x-2}(x-2) &\geq -4(x-2) \\
 6 &\geq -4x+8 \\
 4x &\geq 2 \\
 x &\geq \frac{1}{2}
 \end{aligned}$$

$$\begin{aligned}
 x-2 &> 0 \\
 x &> 2
 \end{aligned}$$

Solution in this case is $x > 2$.

LCD is negative.

$$\begin{aligned}
 \frac{6}{x-2}(x-2) &\leq -4(x-2) \\
 6 &\leq -4x+8 \\
 4x &\leq 2 \\
 x &\leq \frac{1}{2}
 \end{aligned}$$

$$\begin{aligned}
 x-2 &< 0 \\
 x &< 2
 \end{aligned}$$

Solution in this case is $x \leq \frac{1}{2}$.

The solution to the inequality is $x \leq \frac{1}{2}$ or $x > 2$.

b. $\frac{9}{x+3} < 6$

LCD is positive.

$$\begin{aligned}
 \frac{9}{x+3}(x+3) &< 6(x+3) \\
 9 &< 6x+18 \\
 -9 &< 6x \\
 x &> -\frac{3}{2}
 \end{aligned}$$

$$\begin{aligned}
 x+3 &> 0 \\
 x &> -3
 \end{aligned}$$

The solution in this case is $x > -\frac{3}{2}$.

The solution to the inequality is $x < -3$ or $x > -\frac{3}{2}$.

LCD is negative.

$$\begin{aligned}
 \frac{9}{x+3}(x+3) &> 6(x+3) \\
 9 &> 6x+18 \\
 -9 &> 6x \\
 x &< -\frac{3}{2}
 \end{aligned}$$

$$\begin{aligned}
 x+3 &< 0 \\
 x &< -3
 \end{aligned}$$

The solution in this case is $x < -3$.

THINK AND DISCUSS

- Possible answer: The LCD is a multiple of each denominator. Therefore, each denominator is a factor of the LCD.
- Possible answer: When you multiply both sides of an equation by a variable expression, you may produce an equation with solutions that make denominators of the original equation equal to 0.
- Possible answer: (1) Graph each side of the inequality. (2) Multiply both sides by x and consider two cases, x is positive or x is negative.
- Possible answer:

Definition: equations that contain rational expressions	Characteristics: can be solved by multiplying both sides by the LCD of all the terms in the equation; may generate extraneous solutions when solved
Examples: $\frac{1}{x} = 5$, $\frac{x+3}{x-4} = \frac{x}{x-3}$	Nonexamples: $\sqrt{x+2} = 6$, $ x = 5$

EXERCISES P. 605, #2-10, 19-27, 38-43, 58, 59

GUIDED PRACTICE

1. Possible answer: An equation is a statement that 2 expressions are equal. A rational expression is a quotient of 2 polynomials. A rational equation contains at least 1 rational expression.

2. $\frac{1}{8} + \frac{2}{t} = \frac{17}{8t}$

$$\begin{aligned}
 \frac{1}{8}(8t) + \frac{2}{t}(8t) &= \frac{17}{8t}(8t) \\
 t + 16 &= 17 \\
 t &= 1
 \end{aligned}$$

3. $7 = \frac{1}{w} - 4$

$$\begin{aligned}
 7(w) &= \frac{1}{w}(w) - 4(w) \\
 7w &= 1 - 4w \\
 11w &= 1 \\
 w &= \frac{1}{11}
 \end{aligned}$$

4. $\frac{1}{r-5} = \frac{7}{2r}$

$$\begin{aligned}
 \left(\frac{1}{r-5}\right)2r(r-5) &= \left(\frac{7}{2r}\right)2r(r-5) \\
 2r &= 7(r-5) \\
 2r &= 7r-35 \\
 r &= 7
 \end{aligned}$$

5. $\frac{1}{x} = \frac{x}{6} - \frac{5}{6}$

$$\begin{aligned}
 \frac{1}{x}(6x) &= \frac{x}{6}(6x) - \frac{5}{6}(6x) \\
 6 &= x^2 - 5x \\
 x^2 - 5x + 6 &= 0 \\
 (x-6)(x+1) &= 0 \\
 x-6=0 \text{ or } x+1=0 \\
 x=6 \text{ or } x=-1
 \end{aligned}$$

6. $m + \frac{12}{m} = 7$

$$\begin{aligned}
 m(m) + \frac{12}{m}(m) &= 7(m) \\
 m^2 + 12 &= 7m \\
 m^2 - 7m + 12 &= 0 \\
 (m-3)(m-4) &= 0 \\
 m-3=0 \text{ or } m-4=0 \\
 m=3 \text{ or } m=4
 \end{aligned}$$

7. $k + \frac{1}{k} = 2$

$$\begin{aligned}
 k(k) + \frac{1}{k}(k) &= 2(k) \\
 k^2 + 1 &= 2k \\
 k^2 - 2k + 1 &= 0 \\
 (k-1)^2 &= 0 \\
 k-1 &= 0 \\
 k &= 1
 \end{aligned}$$

$$8. \frac{-2x}{x+2} + \frac{x}{3} = \frac{4}{x+2}$$

$$\left(\frac{-2x}{x+2}\right)3(x+2) + \left(\frac{x}{3}\right)3(x+2) = \left(\frac{4}{x+2}\right)3(x+2)$$

$$-6x + x(x+2) = 12$$

$$x^2 - 4x - 12 = 0$$

$$(x-6)(x+2) = 0$$

$$x = 6 \text{ or } x = -2$$

The solution $x = -2$ is extraneous.

The only solution is $x = 6$.

$$9. \frac{x}{x-3} + \frac{x}{2} = \frac{6x}{2x-6}$$

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

$$2x + x(x-3) = 6x$$

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

$$x(x-7) = 0$$

$$x = 0 \text{ or } x = 7$$

$$10. \frac{3}{x(x+1)} - 1 = \frac{3}{x^2+x}$$

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

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

$$x(x+1) = 0$$

$$x = 0 \text{ or } x = -1$$

Both solutions are extraneous.

Therefore there is no solution.

$$11. 16.5 = \frac{60}{8-c} + \frac{60}{8+c}$$

$$16.5(64 - c^2) = \frac{60}{8-c}(64 - c^2) + \frac{60}{8+c}(64 - c^2)$$

$$16.5(64 - c^2) = 60(8 + c) + 60(8 - c)$$

$$1056 - 16.5c^2 = 960$$

$$-16.5c^2 = -96$$

$$c \approx \pm 2.4$$

The average speed of the current is 2.4 mi/h.

This is close to 2 mi/h, so the barge would take

about $\frac{60 \text{ mi}}{8 - 2 \text{ mi/h}}$, or 10 h, to travel upstream

and about $\frac{60 \text{ mi}}{8 + 2 \text{ mi/h}}$, or 6 h, to travel downstream.

The trip should take about 16 h, which is close to the given time, so the answer is reasonable.

$$12. \frac{1}{50}(30) + \frac{1}{m}(30) = 1$$

$$\frac{1}{50}(30)(50m) + \frac{1}{m}(30)(50m) = 1(50m)$$

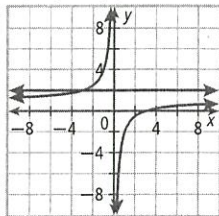
$$30m + 1500 = 50m$$

$$1500 = 20m$$

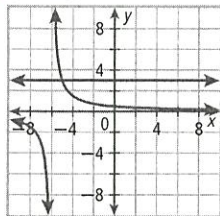
$$75 = m$$

The job will take 75 min if the large copier is broken.

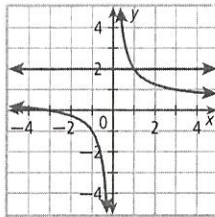
$$13. -5 < x < 0$$



$$14. x = -5$$



$$15. x < 0 \text{ or } x > 1$$



$$16. \frac{4}{x+1} < 4$$

LCD is positive.

LCD is negative.

$$\frac{4}{x+1}(x+1) < 4(x+1)$$

$$4 < 4x + 4$$

$$0 < 4x$$

$$x > 0;$$

$$\frac{4}{x+1}(x+1) > 4(x+1)$$

$$4 > 4x + 4$$

$$0 > 4x$$

$$x < 0;$$

$$x+1 > 0$$

$$x > -1$$

The solution in this case is $x > 0$.

$$x+1 < 0$$

$$x < -1$$

The solution in this case is $x < -1$.

The solution to the inequality is $x < -1$ or $x > 0$.

$$17. \frac{12}{x-4} \leq 3$$

LCD is positive.

LCD is negative.

$$\frac{12}{x-4}(x-4) \leq 3(x-4)$$

$$12 \leq 3x - 12$$

$$24 \leq 3x$$

$$x \geq 8;$$

$$\frac{12}{x-4}(x-4) \geq 3(x-4)$$

$$12 \geq 3x - 12$$

$$24 \geq 3x$$

$$x \leq 8;$$

$$x-4 > 0$$

$$x > 4$$

The solution in this case is $x \geq 8$.

$$x-4 < 0$$

$$x < 4$$

The solution in this case is $x < 4$.

The solution to the inequality is $x < 4$ or $x \geq 8$.

$$18. \frac{10}{x+8} > 2$$

LCD is positive.

LCD is negative.

$$\frac{10}{x+8}(x+8) > 2(x+8)$$

$$10 > 2x + 16$$

$$-6 > 2x$$

$$x < -3;$$

$$\frac{10}{x+8}(x+8) < 2(x+8)$$

$$10 < 2x + 16$$

$$-6 < 2x$$

$$x > -3;$$

$$x+8 > 0$$

$$x > -8$$

The solution in this case is $-8 < x < -3$.

$$x+8 < 0$$

$$x < -8$$

No solution in this case.

The solution to the inequality is $-8 < x < -3$.

PRACTICE AND PROBLEM SOLVING

$$19. 4 + \frac{1}{x} = \frac{10}{2x}$$

$$4(2x) + \frac{1}{x}(2x) = \frac{10}{2x}(2x)$$

$$8x + 2 = 10$$

$$8x = 8$$

$$x = 1$$

$$20. \frac{5}{4} = \frac{n-3}{n-4}$$

$$5(n-4) = 4(n-3)$$

$$5n - 20 = 4n - 12$$

$$n = 8$$

$$21. \frac{1}{a-7} = 3$$

$$1 = 3(a-7)$$

$$\frac{1}{3} = a-7$$

$$\frac{22}{3} = a$$

$$22. \frac{1}{x} - \frac{3}{4} = \frac{x}{4}$$

$$\frac{1}{x}(4x) - \frac{3}{4}(4x) = \frac{x}{4}(4x)$$

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

$$x^2 + 3x - 4 = 0$$

$$(x-1)(x+4) = 0$$

$$x = 1 \text{ or } x = -4$$

$$23. \frac{14}{z} = 9 - z$$

$$\frac{14}{z}(z) = 9(z) - z(z)$$

$$14 = 9z - z^2$$

$$z^2 - 9z + 14 = 0$$

$$(z-2)(z-7) = 0$$

$$z = 2 \text{ or } z = 7$$

$$24. x + \frac{4}{x} = 4$$

$$x(x) + \frac{4}{x}(x) = 4(x)$$

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

$$x^2 - 4x + 4 = 0$$

$$(x-2)^2 = 0$$

$$x-2 = 0$$

$$x = 2$$

$$25. \frac{4x}{x-3} + \frac{x}{2} = \frac{12}{x-3}$$

$$\left(\frac{4x}{x-3}\right)2(x-3) + \left(\frac{x}{2}\right)2(x-3) = \left(\frac{12}{x-3}\right)2(x-3)$$

$$8x + x(x-3) = 24$$

$$x^2 + 5x - 24 = 0$$

$$(x-3)(x+8) = 0$$

$$x = 3 \text{ or } x = -8$$

The solution $x = 3$ is extraneous.
The only solution is $x = -8$.

$$26. \frac{3x}{x+1} = \frac{2x-1}{x+1}$$

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

$$3x = 2x-1$$

$$x = -1$$

The solution $x = -1$ is extraneous.
Therefore there is no solution.

$$27. \frac{2}{x(x-1)} = 1 + \frac{2}{x-1}$$

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

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

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

$$(x-1)(x+2) = 0$$

$$x = 1 \text{ or } x = -2$$

The solution $x = 1$ is extraneous.
The only solution is $x = -2$.

$$28. 22(550 - v) = 17(550 + v)$$

$$12100 - 22v = 9350 + 17v$$

$$2750 = 39v$$

$$71 \approx v$$

The average speed of the wind is about 71 mi/h.
This is close to 70 mi/h. The plane travels about 22(550 - 70), or 10,560, mi on the flight to Bombay and about 22(550 + 70), or 10,540, mi on the flight to Los Angeles. Because the distances are approximately equal, the answer is reasonable.

$$29. \frac{1}{2}(1.5) + \frac{1}{h}(1.5) = 1$$

$$\frac{1}{2}(1.5)(2h) + \frac{1}{h}(1.5)(2h) = 1(2h)$$

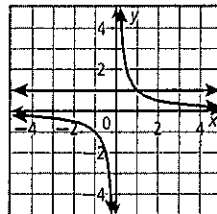
$$1.5h + 3 = 2h$$

$$3 = 0.5h$$

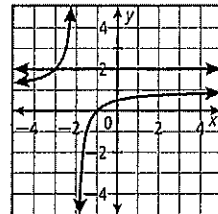
$$6 = h$$

It would take the apprentice 6 h.

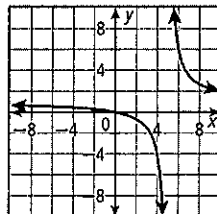
$$30. 0 < x < 1$$



$$31. x = -3$$



$$32. 0 \leq x < 5$$



$$33. \frac{1}{3x} < 2$$

LCD is positive.

$$\frac{1}{3x}(3x) < 2(3x)$$

$$1 < 6x$$

$$x > \frac{1}{6}$$

$$3x > 0$$

$$x > 0$$

The solution in this case
is $x > \frac{1}{6}$.

LCD is negative.

$$\frac{1}{3x}(3x) > 2(3x)$$

$$1 > 6x$$

$$x < \frac{1}{6}$$

$$3x < 0$$

$$x < 0$$

The solution in this case
is $x < 0$.

The solution to the inequality is $x < 0$ or $x > \frac{1}{6}$.

$$34. \frac{9}{x-4} \geq -6$$

LCD is positive.

$$\frac{9}{x-4}(x-4) \geq -6(x-4)$$

$$9 \geq -6x + 24$$

$$6x \geq 15$$

$$x \geq 2.5$$

$$x-4 > 0$$

$$x > 4$$

The solution in this case
is $x > 4$.

LCD is negative.

$$\frac{9}{x-4}(x-4) \leq -6(x-4)$$

$$9 \leq -6x + 24$$

$$6x \leq 15$$

$$x \leq 2.5$$

$$x-4 < 0$$

$$x < 4$$

The solution in this case
is $x \leq 2.5$.

The solution to the inequality is $x \leq 2.5$ or $x > 4$.

35. $\frac{9}{x+10} > 3$
 LCD is positive. LCD is negative.
 $\frac{9}{x+10}(x+10) > 3(x+10)$ $\frac{9}{x+10}(x+10) < 3(x+10)$
 $9 > 3x + 30$ $9 < 3x + 30$
 $-21 > 3x$ $-21 < 3x$
 $x < -7$ $x > -7$;
 $x + 10 > 0$ $x + 10 < 0$
 $x > -10$ $x < -10$
 The solution in this case is No solution in this case.
 $-10 < x < -7$.
 The solution to the inequality is $-10 < x < -7$.

36a. $P \leq 2w + 2\left(\frac{17,000}{w}\right)$ or equivalent inequality
 b. No; substituting 400 for P in the inequality results in nonreal values of w .

37a. 2003
 b. Possible answer: $\frac{188 + h}{643 + h} = \frac{191}{614}$; 18 hits
 c. $\frac{156 + h}{482 + h} = \frac{0.5}{1}$
 $156 + h = 241 + 0.5h$
 $0.5h = 85$
 $h = 170$
 170 hits; He had 326 more at bats than hits, and this will stay constant with each hit. He would need to reach a total of 326 hits from 156 hits, so the answer is reasonable.

38. $\frac{15n}{n-3} = \frac{5}{n-3} - 8$
 $\frac{15n}{n-3}(n-3) = \frac{5}{n-3}(n-3) - 8(n-3)$
 $15n = 5 - 8(n-3)$
 $15n = 5 - 8n + 24$
 $23n = 29$
 $n = \frac{29}{23}$

39. $\frac{z}{z+1} = \frac{z}{z-4}$
 $z(z-4) = z(z+1)$
 $z^2 - 4z = z^2 + z$
 $-4z = z$
 $z = 0$

40. $\frac{4}{x} + 6 = \frac{1}{x^2}$
 $\frac{4}{x}(x^2) + 6(x^2) = \frac{1}{x^2}(x^2)$
 $4x + 6x^2 = 1$
 $6x^2 + 4x - 1 = 0$
 $x = \frac{-4 \pm \sqrt{4^2 - 4(6)(-1)}}{2(6)} = \frac{-2 \pm \sqrt{10}}{6}$

41. $\frac{8}{x} - \frac{3}{x} = \frac{6}{x-1}$
 $\left(\frac{8}{x}\right)x(x-1) - \left(\frac{3}{x}\right)x(x-1) = \left(\frac{6}{x-1}\right)x(x-1)$
 $8(x-1) - 3(x-1) = 6x$
 $5x - 5 = 6x$
 $x = -5$

42. $\frac{2(x+4)}{x-4} = \frac{3x}{x-4}$
 $2(x+4) = 3x$
 $2x + 8 = 3x$
 $x = 8$

43. $\frac{1}{a-1} + \frac{4}{a+1} = \frac{7}{a^2-1}$
 $\frac{1}{a-1}(a^2-1) + \frac{4}{a+1}(a^2-1) = \frac{7}{a^2-1}(a^2-1)$
 $(a+1) + 4(a-1) = 7$
 $5a - 3 = 7$
 $5a = 10$
 $a = 2$

44. $\frac{6}{r} \geq \frac{5}{2}$
 LCD is positive. LCD is negative.
 $\frac{6}{r}(r) \geq \frac{5}{2}(r)$ $\frac{6}{r}(r) \leq \frac{5}{2}(r)$
 $6 \geq 2.5r$ $6 \leq 2.5r$
 $r \leq 2.4$ $r \geq 2.4$;
 The solution in this case is 0 $< r \leq 2.4$. No solution in this case.
 The solution to the inequality is 0 $< r \leq 2.4$.

45. $\frac{8}{x+1} > 4$
 LCD is positive. LCD is negative.
 $\frac{8}{x+1}(x+1) > 4(x+1)$ $\frac{8}{x+1}(x+1) < 4(x+1)$
 $8 > 4x + 4$ $8 < 4x + 4$
 $4 > 4x$ $4 < 4x$
 $x < 1$ $x > 1$;
 $x + 1 > 0$ $x + 1 < 0$
 $x > -1$ $x < -1$
 The solution in this case is $-1 < x < 1$. No solution in this case.
 The solution to the inequality is $-1 < x < 1$.

46. $x \geq \frac{4}{x}$
 LCD is positive. LCD is negative.
 $x(x) \geq \frac{4}{x}(x)$ $x(x) \leq \frac{4}{x}(x)$
 $x^2 \geq 4$ $x^2 \leq 4$
 $x \leq -2$ or $x \geq 2$; $-2 \leq x \leq 2$;
 The solution in this case is $x \geq 2$. The solution in this case is $-2 \leq x < 0$.
 The solution to the inequality is $-2 \leq x < 0$ or $x \geq 2$.

47. ± 0.45

48. ± 1.27

49. 0, 2

50. $\frac{1}{x} + \frac{7}{2} = 2$
 $\frac{1}{x} = -\frac{3}{2}$
 $x = -\frac{2}{3}$

51a. 2001 winner: $\frac{500}{s}$;
 2002 winner: $\frac{500}{s+25}$

b. Possible answer: $\frac{500}{s+25} + \frac{32}{60} = \frac{500}{s}$;

$$15\left(\frac{500s(s+25)}{s+25} + \frac{8s(s+25)}{15}\right) = 15\left(\frac{500s(s+25)}{s}\right)$$

$$7500s + 8s(s+25) = 7500(s+25)$$

$$8s^2 + 200s - 187500 = 0$$

$$s = \frac{-200 \pm \sqrt{200^2 - 4(8)(-187500)}}{2(8)}$$

$$s \approx 141 \text{ or } -166$$

The average speed of the 2001 winner is 141 mi/h.

52. depending on the values of a , b , and c , either 2, 1, or 0

53. Multiply each term by the LCD, $5x$.

Divide out common factors, to get $3x^2 = 15 - 30x$.

Simplify, to get $x^2 + 10x - 5 = 0$.

Use the quadratic formula to solve for x

$$x = -5 \pm \sqrt{30}.$$

TEST PREP

54. A;

$$\frac{1}{x} + \frac{3}{x+3} = \frac{6}{x}$$

$$\left(\frac{1}{x}\right)x(x+3) + \left(\frac{3}{x+3}\right)x(x+3) = \left(\frac{6}{x}\right)x(x+3)$$

$$(x+3) + 3x = 6(x+3)$$

$$4x + 3 = 6x + 18$$

$$-15 = 2x$$

$$-\frac{15}{2} = x$$

55. G;

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

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

$$x(x+2) - (x-4) = 4$$

$$x^2 + x = 0$$

$$x(x+1) = 0$$

$$x = 0 \text{ or } x + 1 = 0$$

$$x = 0 \text{ or } x = -1$$

The solution $x = 0$ is extraneous.

The only solution is $x = -1$.

56. B

57a. Possible answer: $\frac{1}{15}(7) + \frac{1}{h}(7) = 1$

b. $\frac{1}{15}(7)(15h) + \frac{1}{h}(7)(15h) = 1(15h)$

$$7h + 105 = 15h$$

$$105 = 8h$$

$$13 \approx h$$

It would take about 13 h to fill the tank.

CHALLENGE AND EXTEND

58. $\frac{4x}{x^2+x-6} = \frac{7x}{x^2-5x-24}$
 $\frac{4x(x-2)(x+3)(x-8)}{(x-2)(x+3)} = \frac{7x(x-2)(x+3)(x-8)}{(x-8)(x+3)}$

$$4x(x-8) = 7x(x-2)$$

$$3x^2 + 18x = 0$$

$$3x(x+6) = 0$$

$$x = 0 \text{ or } x + 6 = 0$$

$$x = 0 \text{ or } x = -6$$

59. $\frac{1-4x^{-1}+3x^{-2}}{1-9x^{-2}} = \frac{x-1}{x+3}$

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

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

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

$$\frac{x-1}{x+3} = \frac{x-1}{x+3}$$

all real numbers except -3 , 0 , and 3 .

60. $\frac{3x}{x+2} - \frac{2}{x+4} \geq 7$

LCD is positive.

$$\frac{3x(x+2)(x+4)}{x+2} - \frac{2(x+2)(x+4)}{x+4} \geq 7(x+2)(x+4)$$

$$3x(x+4) - 2(x+2) \geq 7(x+2)(x+4)$$

$$4x^2 + 32x + 60 \leq 0$$

$$4(x+3)(x+5) \leq 0$$

$$x+3 \leq 0 \text{ and } x+5 \geq 0$$

$$-5 \leq x \leq -3;$$

$$(x+2)(x+4) > 0$$

$$x+2 > 0 \text{ and } x+4 > 0$$

$$x > -2 \text{ or } x < -4$$

The solution in this case is $-5 \leq x < -4$.

LCD is negative.

$$\frac{3x(x+2)(x+4)}{x+2} - \frac{2(x+2)(x+4)}{x+4} \leq 7(x+2)(x+4)$$

$$3x(x+4) - 2(x+2) \leq 7(x+2)(x+4)$$

$$4x^2 + 32x + 60 \geq 0$$

$$4(x+3)(x+5) \geq 0$$

$$x+3 \geq 0 \text{ and } x+5 \geq 0$$

$$x \geq -3 \text{ or } x \leq -5$$

$$(x+2)(x+4) < 0$$

$$x+2 < 0 \text{ and } x+4 > 0$$

$$-4 < x < -2$$

The solution in this case is $-3 \leq x < -2$.

The solution to the inequality is $-5 \leq x < -4$ or

$$-3 \leq x < -2.$$

$$61. \frac{6}{x-3} > \frac{x}{4} + 5$$

LCD is positive.

$$\left(\frac{6}{x-3}\right)4(x-3) > \left(\frac{x}{4}\right)4(x-3) + (5)4(x-3)$$

$$24 > x(x-3) + 20(x-3)$$

$$x^2 + 17x - 84 < 0$$

$$(x-4)(x+21) < 0$$

$$x-4 < 0 \text{ and } x+21 > 0$$

$$-21 < x < 4;$$

$$x-3 > 0$$

$$x > 3$$

The solution in this case is $3 < x < 4$.

LCD is negative.

$$\left(\frac{6}{x-3}\right)4(x-3) < \left(\frac{x}{4}\right)4(x-3) + (5)4(x-3)$$

$$24 < x(x-3) + 20(x-3)$$

$$x^2 + 17x - 84 > 0$$

$$(x-4)(x+21) > 0$$

$$x-4 > 0 \text{ and } x+21 > 0$$

$$x > 4 \text{ or } x < -21;$$

$$x-3 < 0$$

$$x < 3$$

The solution in this case is $x < -21$.

The solution to the inequality is $x < -21$ or

$$3 < x < 4.$$

62. Let h be the number of hours needed for Marcus to paint the barn individually, then $2h$ will be the number of hours needed for Will.

$$\frac{1}{h}(6) + \frac{1}{2h}(6) = \frac{1}{3}$$

$$\frac{1}{h}(6)(2h) + \frac{1}{2h}(6)(2h) = \frac{1}{3}(2h)$$

$$12 + 6 = \frac{2}{3}h$$

$$h = 27$$

$$\left(1 - \frac{1}{3}\right) \div \frac{1}{27} = \frac{2}{3} \div \frac{1}{27} = 18$$

It will take Marcus 18 additional hours to complete.

SPIRAL REVIEW

$$63. 4(4+x) - \frac{1}{2}(4)(x)$$

$$16 + 4x - 2x$$

$$2x + 16$$

$$64. \frac{-3\sqrt{3}}{\sqrt{8}}$$

$$\frac{-3\sqrt{3}}{\sqrt{8}} \left(\frac{\sqrt{2}}{\sqrt{2}} \right)$$

$$\frac{-3\sqrt{6}}{\sqrt{16}}$$

$$\frac{-3\sqrt{6}}{4}$$

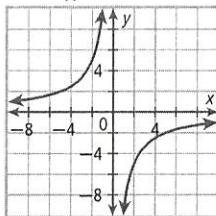
$$65. \frac{5}{4\sqrt{7}}$$

$$\frac{5}{4\sqrt{7}} \left(\frac{\sqrt{7}}{\sqrt{7}} \right)$$

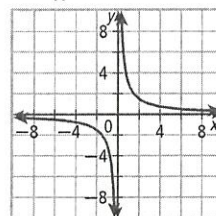
$$\frac{5\sqrt{7}}{4(7)}$$

$$\frac{5\sqrt{7}}{28}$$

$$66. y = \frac{-10}{x}$$



$$67. y = \frac{3}{x}$$



READY TO GO ON? PAGE 609

1-11, 15-19

$$1. \frac{m_1}{V_1} = \frac{m_2}{V_2}$$

$$\frac{8.7}{1000} = \frac{m}{4500}$$

$$1000m = 8.7(4500)$$

$$m = 39.15$$

The mass of the statue is 39.15 kg.

$$2. t = \frac{k}{n}$$

$$6 = \frac{k}{6}$$

$$k = 36$$

$$t = \frac{k}{n} = \frac{36}{10} = 3.6$$

It will take 10 workers 3.6 h to clean the rides.

$$3. \frac{5x^3}{10x^2 + 5x}$$

$$\frac{5x^3}{5x(2x+1)}$$

$$\frac{x^2}{2x+1};$$

$$2x+1;$$

$$x \neq -\frac{1}{2} \text{ and } x \neq 0$$

$$4. \frac{x^2 - 2x - 3}{x^2 + 5x + 4}$$

$$\frac{(x-3)(x+1)}{(x+4)(x+1)}$$

$$\frac{x-3}{x+4};$$

$$x+4;$$

$$x \neq -4 \text{ and } x \neq -1$$

$$5. \frac{-x+6}{x^2 - 3x - 18}$$

$$\frac{-(x-6)}{(x-6)(x+3)}$$

$$\frac{-1}{x+3};$$

$$x \neq -3 \text{ and } x \neq 6$$

$$6. \frac{x+3}{x+2} \cdot \frac{2x-4}{x^2 - 9}$$

$$\frac{x+3}{x+2} \cdot \frac{2(x-2)}{(x+3)(x-3)}$$

$$\frac{2(x-2)}{(x+2)(x-3)}$$

$$7. \frac{9x^6y}{27x^2y^5} \div \frac{x}{6y^2}$$

$$\frac{x^4}{3y^4} \cdot \frac{6y^2}{x}$$

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

$$y^2$$

$$8. \frac{2x^3 - 18x}{x^2 - 2x - 8} \div \frac{x^2 + x - 12}{x^2 - 16}$$

$$\frac{2x(x^2 - 9)}{(x-4)(x+2)} \cdot \frac{(x+4)(x-4)}{(x+4)(x-3)}$$

$$\frac{2x(x+3)(x-3)}{(x-4)(x+2)} \cdot \frac{x-4}{x-3}$$

$$\frac{2x(x+3)}{x+2}$$

$$x+2$$

$$9. \frac{3x+2}{x-2} - \frac{x+5}{x-2}$$

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

$$\frac{2x-3}{x-2}; x \neq 2$$

$$10. \frac{x^2-x}{x^2-25} + \frac{3}{x+5}$$

$$\frac{x^2-x}{x^2-25} + \frac{3}{x+5} \left(\frac{x-5}{x-5} \right)$$

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

$$\frac{x^2+2x-15}{(x+5)(x-5)}$$

$$\frac{(x+5)(x-3)}{(x+5)(x-5)}$$

$$\frac{x-3}{x-5}; x \neq -5 \text{ and } x \neq 5$$

$$11. \frac{x}{x-3} - \frac{1}{x+3}$$

$$\frac{x}{x-3} \left(\frac{x+3}{x+3} \right) - \frac{1}{x+3} \left(\frac{x-3}{x-3} \right)$$

$$\frac{x(x+3)-(x-3)}{(x-3)(x+3)}$$

$$\frac{x^2+2x+3}{(x-3)(x+3)}; x \neq -3 \text{ and } x \neq 3$$

$$\frac{2d}{550} + \frac{d}{430}$$

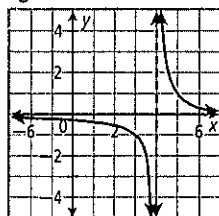
$$\frac{2d(23650)}{550(23650) + d(23650)}$$

$$\frac{47300d}{43d + 55d}$$

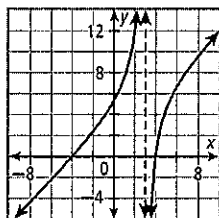
$$\frac{47300d}{98d} \approx 483$$

The average speed for the entire trip is 483 mi/h.

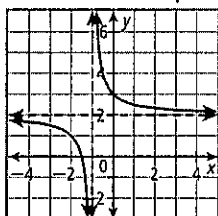
~~13.~~ g is f translated 4 units right.



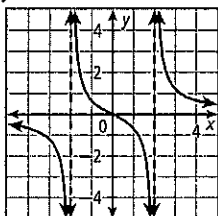
15. zeros: 4, -4;
vertical asymptote:
 $x = 3$



~~14.~~ g is f translated 1 unit left and 2 units up.



16. zero: 0;
vertical asymptotes:
 $x = -2, x = 2$,
horizontal asymptote:
 $y = 0$



$$17. y - \frac{10}{y} = 3$$

$$y(y) - \frac{10}{y}(y) = 3(y)$$

$$y^2 - 10 = 3y$$

$$y^2 - 3y - 10 = 0$$

$$(y-5)(y+2) = 0$$

$$y-5 = 0 \text{ or } y+2 = 0$$

$$y = 5 \text{ or } y = -2$$

$$18. \frac{x}{x-8} = \frac{24-2x}{x-8}$$

$$\frac{x}{x-8}(x-8) = \frac{24-2x}{x-8}(x-8)$$

$$x = 24 - 2x$$

$$x = 8$$

The solution $x = 8$ is extraneous.
Therefore there is no solution.

$$19. \frac{-3x}{3} - \frac{x+15}{x+9} = 1$$

$$\frac{-3x}{3}(x+9) - \frac{x+15}{x+9}(x+9) = 1(x+9)$$

$$-x(x+9) - (x+15) = x+9$$

$$-x^2 - 11x - 24 = 0$$

$$-(x+3)(x+8) = 0$$

$$x+3 = 0 \text{ or } x+8 = 0$$

$$x = -3 \text{ or } x = -8$$

$$\frac{1}{4}(3) + \frac{1}{h}(3) = 1$$

$$\frac{1}{4}(3)(4h) + \frac{1}{h}(3)(4h) = 1(4h)$$

$$3h + 12 = 4h$$

$$h = 12$$

It would take the small oven 12 hours to bake the bread.

8-6 RADICAL EXPRESSIONS AND RATIONAL EXPONENTS, PAGES 610–617

CHECK IT OUT!

1a. no real roots

b. ± 1

c. 5

$$2a. \sqrt[4]{16x^4}$$

$$\sqrt[4]{2^4 \cdot x^4}$$

$$\sqrt[4]{2^4} \cdot \sqrt[4]{x^4}$$

$$2 \cdot x^2$$

$$2x^2$$

$$b. \sqrt[4]{\frac{x^8}{3}}$$

$$\frac{\sqrt[4]{x^8} \cdot \sqrt[4]{x^4}}{\sqrt[4]{3} \cdot \sqrt[4]{x^4}}$$

$$\frac{x^2}{\sqrt[4]{3}}$$

$$\frac{x^2}{\sqrt[4]{3}} \cdot \frac{\sqrt[4]{3}}{\sqrt[4]{3}} \cdot \frac{\sqrt[4]{3}}{\sqrt[4]{3}} \cdot \frac{\sqrt[4]{3}}{\sqrt[4]{3}}$$

$$\frac{x^2 \sqrt[4]{3^3}}{\sqrt[4]{3^4}}$$

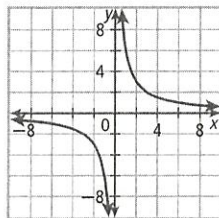
$$\frac{x^2 \sqrt[4]{27}}{3}$$

P. 638, #5, 9, 11-34, 40-50

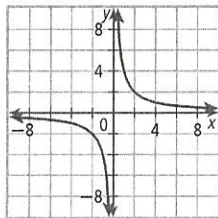
5. $n = ka$
 $180 = k(20)$
 $9 = k$
 $n = 9a = 9(34) = 306$
 The number of tiles needed is 306.

6. $I = kPr$
 $264 = k(1100)(0.12)$
 $2 = k$
 $I = 2Pr$
 $360 = 2P(0.09)$
 $360 = 0.18P$
 $2000 = P$
 The principle P is \$2000.

7. $y = \frac{6}{x}$



8. $y = \frac{4}{x}$



9. $I = \frac{k}{R}$
 $8 = \frac{k}{15}$
 $120 = k$
 $I = \frac{120}{R}$
 $5 = \frac{120}{R}$
 $24 = R$
 The resistance R is 24 ohms.

10. inverse variation

LESSON 8-2

11. $\frac{24x^{14}}{9x^{16}}$
 $\frac{24}{9} \cdot x^{14-16}$
 $\frac{8}{3}x^{-2}$
 $\frac{8}{3x^2}; x \neq 0$

13. $\frac{x^2 + x - 12}{x^2 + 5x + 4}$
 $\frac{(x+4)(x-3)}{(x+4)(x+1)}$
 $\frac{x-3}{x+1}; x \neq -4 \text{ and } x \neq -1$

15. $\frac{x}{x-4} \cdot \frac{-x+2}{x^2+x-6}$
 $\frac{x}{x-4} \cdot \frac{-(x-2)}{(x+3)(x-2)}$
 $\frac{-x}{(x-4)(x+3)}$

12. $\frac{6x^3}{3x+12}$
 $\frac{6x^3}{3(x+4)}$
 $\frac{2x^3}{x+4}; x \neq -4$

14. $\frac{x+5}{3x+1} \cdot \frac{9x+3}{x^2-25}$
 $\frac{x+5}{3x+1} \cdot \frac{3(3x+1)}{(x+5)(x-5)}$
 $\frac{3}{x-5}$

16. $\frac{x^2+2x-3}{x^2-x-2} \cdot \frac{x-2}{x+3}$
 $\frac{(x+3)(x-1)}{(x-2)(x+1)} \cdot \frac{x-2}{x+3}$
 $\frac{x-1}{x+1}$

17. $\frac{9x^2-1}{x^2-9} \cdot \frac{x+3}{3x+1}$
 $\frac{(3x+1)(3x-1)}{(x+3)(x-3)} \cdot \frac{x+3}{3x+1}$
 $\frac{3x-1}{x-3}$

19. $\frac{x^2+2x-15}{x-2} \div \frac{x^2-9}{2x-4}$
 $\frac{(x+5)(x-3)}{x-2} \cdot \frac{2(x-2)}{(x+3)(x-3)}$
 $\frac{2(x+5)}{x+3}$

20. $\frac{3x-21}{3x} \div \frac{x^2-49}{x^2+7x}$
 $\frac{3(x-7)}{3x} \cdot \frac{x(x+7)}{(x-7)(x+7)}$
 $\frac{x-7}{x} \cdot \frac{x}{x-7}$
 1

21. $\frac{x^2+4x+3}{x^2+2x-8} \div \frac{3x+3}{x-2}$
 $\frac{(x+1)(x+3)}{(x+4)(x-2)} \cdot \frac{x-2}{3(x+1)}$
 $\frac{x+3}{3(x+4)}$

LESSON 8-3

22. $\frac{4}{x^2+4} + \frac{x^2+8}{x^2+4}$
 $\frac{4+x^2+8}{x^2+4}$
 $\frac{x^2+12}{x^2+4}$

23. $\frac{1}{x+3} + \frac{1}{x-3}$
 $\frac{1}{x+3} \cdot \frac{(x-3)}{(x-3)} + \frac{1}{x-3} \cdot \frac{(x+3)}{(x+3)}$
 $\frac{x-3+x+3}{(x+3)(x-3)}$
 $\frac{2x}{(x+3)(x-3)}; x \neq \pm 3$

24. $\frac{x}{x^2-4} + \frac{1}{x-2}$
 $\frac{x}{(x+2)(x-2)} + \frac{1}{x-2} \cdot \frac{(x+2)}{(x+2)}$
 $\frac{x+x+2}{(x+2)(x-2)}$
 $\frac{2x+2}{(x+2)(x-2)}$
 $\frac{2(x+1)}{(x+2)(x-2)}; x \neq \pm 2$

25. $\frac{2x-3}{3x+7} + \frac{6}{4x-1}$
 $\frac{2x-3}{3x+7} \cdot \frac{(4x-1)}{(4x-1)} + \frac{6}{4x-1} \cdot \frac{(3x+7)}{(3x+7)}$
 $\frac{(2x-3)(4x-1) + 6(3x+7)}{(3x+7)(4x-1)}$
 $\frac{8x^2+4x+45}{(3x+7)(4x-1)}; x \neq -\frac{7}{3} \text{ and } x \neq \frac{1}{4}$

26. $x^2-9 = (x+3)(x-3)$
 $x^2-6x+9 = (x-3)^2$
 The LCD is $(x+3)(x-3)^2$.

$$27. x^2 + 2x - 35 = (x + 7)(x - 5)$$

$$x^2 + 9x + 14 = (x + 7)(x + 2)$$

The LCD is $(x - 5)(x + 2)(x + 7)$.

$$28. \frac{2x}{x+4} - \frac{3}{x+4} \quad 29. \frac{x}{x+5} - \frac{5}{x-5}$$

$$\frac{2x-3}{x+4}; x \neq -4 \quad \frac{x}{x+5} \cdot \frac{(x-5)}{(x-5)} - \frac{5}{x-5} \cdot \frac{(x+5)}{(x+5)}$$

$$\frac{x(x-5) - 5(x+5)}{(x+5)(x-5)}$$

$$\frac{x^2 - 10x - 25}{(x+5)(x-5)}; x \neq \pm 5$$

$$30. \frac{1}{x^2 - x - 6} - \frac{x}{x+2}$$

$$\frac{1}{(x-3)(x+2)} - \frac{x}{x+2} \cdot \frac{(x-3)}{(x-3)}$$

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

$$\frac{-x^2 + 3x + 1}{(x-3)(x+2)}; x \neq -2 \text{ and } x \neq 3$$

$$31. \frac{2x}{2x+1} - \frac{7}{3x-1}$$

$$\frac{2x}{2x+1} \cdot \frac{(3x-1)}{(3x-1)} - \frac{7}{3x-1} \cdot \frac{(2x+1)}{(2x+1)}$$

$$\frac{2x(3x-1) - 7(2x+1)}{(3x-1)(2x+1)}$$

$$\frac{6x^2 - 16x - 7}{(2x+1)(3x-1)}; x \neq -\frac{1}{2} \text{ and } x \neq \frac{1}{3}$$

$$32. \frac{x-6}{5} \div \frac{x+2}{8}$$

$$\frac{x-6}{5} \cdot \frac{8}{x+2}$$

$$\frac{8(x-6)}{5(x+2)}$$

$$\frac{x-1}{4} \div \frac{x}{x-2}$$

$$\frac{x-1}{4} \cdot \frac{(x-2)}{(x-2)}$$

$$\frac{(x-1)(x-2)}{4(x-2)}$$

$$\frac{x^2 - 2x + 2}{4(x-2)}$$

$$\frac{(x^2 - 4)(x-2)}{4x(x+2)}$$

$$\frac{(x+2)(x-2)(x-2)}{4x(x+2)}$$

$$\frac{(x-2)^2}{4x}$$

$$34. \frac{x+2}{x-2} - \left(\frac{1}{x}\right)4x(x-2) - \left(\frac{1}{x}\right)4x(x-2)$$

$$\frac{(x+2)}{(x-2)}4x(x-2) - \frac{(x+2)}{(x-2)}4x(x-2)$$

$$\frac{x^2(x-2) - 4x(x-2)}{4x(x+2)}$$

$$\frac{(x^2 - 4)(x-2)}{4x(x+2)}$$

$$\frac{(x+2)(x-2)(x-2)}{4x(x+2)}$$

$$\frac{(x-2)^2}{4x}$$

$$36. \frac{2d}{\frac{d}{520} + \frac{d}{580}}$$

$$\frac{2d(15080)}{\frac{d}{520}(15080) + \frac{d}{580}(15080)}$$

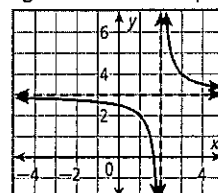
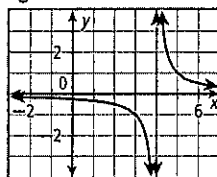
$$\frac{30160d}{29d + 26d}$$

$$\frac{30160d}{55d} \approx 548$$

The jet's average speed is about 548 mi/h.

LESSON 8-4

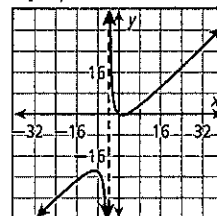
36. g is f translated 4 units right. 37. g is f translated 2 units right and 3 units up.



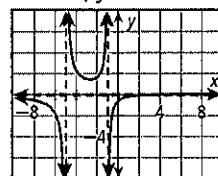
38. asymptotes: $x = 1$, $y = -3$;
D: $\{x \mid x \neq 1\}$; R: $\{y \mid y \neq -3\}$

39. asymptotes: $x = -2$, $y = 1$;
D: $\{x \mid x \neq -2\}$; R: $\{y \mid y \neq 1\}$

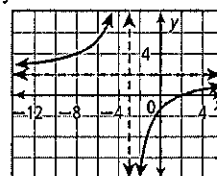
40. zeros: 0, 3;
asymptote: $x = -4$



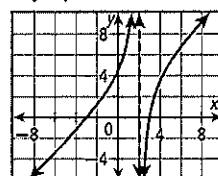
41. zero: 3;
asymptotes: $x = -5$,
 $x = -1$, $y = 0$



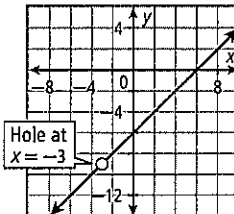
42. zero: 2;
asymptotes: $x = -3$,
 $y = 2$



43. zeros: -3, 3;
asymptote: $x = 2$



44. hole at $x = -3$



LESSON 8-5

45. $x - \frac{6}{x} = 1$

$$x(x) - \frac{6}{x}(x) = 1(x)$$

$$x^2 - 6 = x$$

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

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

$$x = 3 \text{ or } x = -2$$

46. $\frac{4x}{x-5} = \frac{3x+5}{x-5}$

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

$$4x = 3x + 5$$

$$x = 5$$

The solution $x = 5$ is extraneous.

Therefore there is no solution.

47. $\frac{3x}{x+2} = \frac{2x+2}{x+2}$

$$\frac{3x}{x+2}(x+2) = \frac{2x+2}{x+2}(x+2)$$

$$3x = 2x + 2$$

$$x = 2$$

48. $\frac{x}{x+4} + \frac{x}{2} = \frac{2x}{2x+8}$

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

$$2x + x(x+4) = 2x$$

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

$$x = 0 \text{ or } x = -4$$

The solution $x = -4$ is extraneous.

The only solution is $x = 0$.

49. $\frac{x+4}{x} > -2$

x is positive.

$$\left(\frac{x+4}{x}\right)x > -2(x)$$

$$x + 4 > -2x$$

$$3x > -4$$

$$x > -\frac{4}{3}$$

The solution in this case is $x > 0$.

x is negative.

$$\left(\frac{x+4}{x}\right)x < -2(x)$$

$$x + 4 < -2x$$

$$3x < -4$$

$$x < -\frac{4}{3}$$

The solution in this case is $x < -\frac{4}{3}$.

The solution to the inequality is $x < -\frac{4}{3}$ or $x > 0$.

50. $\frac{2}{x-3} < 4$

$x - 3$ is positive.

$$\frac{2}{x-3}(x-3) < 4(x-3)$$

$$2 < 4x - 12$$

$$14 < 4x$$

$$x > \frac{7}{2}$$

$$x - 3 > 0$$

$$x > 3$$

The solution in this case is $x > \frac{7}{2}$.

$x - 3$ is negative.

$$\frac{2}{x-3}(x-3) > 4(x-3)$$

$$2 > 4x - 12$$

$$14 > 4x$$

$$x < \frac{7}{2}$$

$$x - 3 < 0$$

$$x < 3$$

The solution in this case is $x < 3$.

The solution to the inequality is $x < 3$ or $x > \frac{7}{2}$.

STOP HERE! ☺

LESSON 8-6

51. $\sqrt[3]{27x^6}$

$$\sqrt[3]{3^3 \cdot x^3 \cdot x^3}$$

$$\sqrt[3]{3^3} \cdot \sqrt[3]{x^3} \cdot \sqrt[3]{x^3}$$

$$3x^2$$

53. $\sqrt[3]{\frac{8x^3}{3}}$

$$\frac{\sqrt[3]{8x^3}}{\sqrt[3]{3}}$$

$$\frac{\sqrt[3]{2^3 \cdot x^3}}{\sqrt[3]{3}}$$

$$\frac{\sqrt[3]{2^3} \cdot \sqrt[3]{x^3}}{\sqrt[3]{3}}$$

$$\frac{2x}{\sqrt[3]{3}}$$

55. $16^{\frac{3}{4}}$

$$\sqrt[4]{16^3}$$

$$\sqrt[4]{2^4 \cdot 2^4 \cdot 2^4}$$

$$2 \cdot 2 \cdot 2 = 8$$

57. $17^{\frac{1}{3}} \cdot 17^{\frac{2}{3}}$

$$17^{\frac{1}{3} + \frac{2}{3}}$$

$$17^1 = 17$$

59. $\left(\frac{1}{16}\right)^{\frac{1}{4}}$

$$\sqrt[4]{\frac{1}{16}}$$

$$\frac{\sqrt[4]{1}}{\sqrt[4]{16}}$$

$$\frac{1}{2}$$

52. $\sqrt[4]{81x^{12}}$

$$\sqrt[4]{3^4 \cdot x^4 \cdot x^4 \cdot x^4}$$

$$\sqrt[4]{3^4} \cdot \sqrt[4]{x^4} \cdot \sqrt[4]{x^4} \cdot \sqrt[4]{x^4}$$

$$3x^3$$

54. $(-27)^{\frac{2}{3}}$

$$\sqrt[3]{(-27)^2}$$

$$\sqrt[3]{729}$$

$$9$$

56. $9^{\frac{3}{2}}$

$$\sqrt{9^3}$$

$$\sqrt{729}$$

$$27$$

58. $(9^4)^{\frac{1}{2}}$

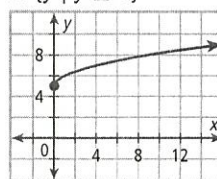
$$9^{4 \cdot \frac{1}{2}}$$

$$9^2 = 81$$

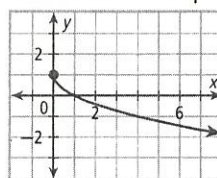
LESSON 8-7

60. D: $\{x \mid x \geq 0\}$;

R: $\{y \mid y \geq 5\}$

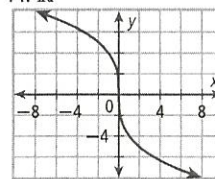


62. g is f reflected across the x -axis and translated 1 unit up.



61. D: $\mathbb{R}$;

R: $\mathbb{R}$



63. h is f compressed horizontally by a factor of $\frac{1}{4}$.

