

## Extra Practice *continued*

42.  $5x + 2y = 8$

$-2x - 9y = 46$

$$\begin{bmatrix} 5 & 2 \\ -2 & -9 \end{bmatrix}$$

$$A^{-1} = \frac{1}{-45 + 4} \begin{bmatrix} -9 & -2 \\ 2 & 5 \end{bmatrix} = \begin{bmatrix} \frac{9}{41} & \frac{2}{41} \\ -\frac{2}{41} & -\frac{5}{41} \end{bmatrix}$$

$$\begin{bmatrix} \frac{9}{41} & \frac{2}{41} \\ -\frac{2}{41} & -\frac{5}{41} \end{bmatrix} \begin{bmatrix} 8 \\ 46 \end{bmatrix} = \begin{bmatrix} (\frac{9}{41})(8) + (\frac{2}{41})(46) \\ (-\frac{2}{41})(8) + (-\frac{5}{41})(46) \end{bmatrix} = \begin{bmatrix} 4 \\ -6 \end{bmatrix}$$

$(4, -6)$

43.  $3x - 8y = 16$

$-2x + 5y = -10$

$$\begin{bmatrix} 3 & -8 \\ -2 & 5 \end{bmatrix}$$

$$A^{-1} = \frac{1}{15 - 16} \begin{bmatrix} 5 & 8 \\ 2 & 3 \end{bmatrix} = \begin{bmatrix} -5 & -8 \\ -2 & -3 \end{bmatrix}$$

$$\begin{bmatrix} -5 & -8 \\ -2 & -3 \end{bmatrix} \begin{bmatrix} 16 \\ -10 \end{bmatrix} = \begin{bmatrix} (-5)(16) + (-8)(-10) \\ (-2)(16) + (-3)(-10) \end{bmatrix} = \begin{bmatrix} 0 \\ -2 \end{bmatrix}$$

$(0, -2)$

44.  $-7x - 2y = -8$

$3x - 6y = 0$

$$\begin{bmatrix} -7 & -2 \\ 3 & -6 \end{bmatrix}$$

$$A^{-1} = \frac{1}{42 + 6} \begin{bmatrix} -6 & 2 \\ -3 & -7 \end{bmatrix} = \begin{bmatrix} -\frac{1}{8} & \frac{1}{24} \\ -\frac{1}{16} & -\frac{7}{48} \end{bmatrix}$$

$$\begin{bmatrix} -\frac{1}{8} & \frac{1}{24} \\ -\frac{1}{16} & -\frac{7}{48} \end{bmatrix} \begin{bmatrix} -8 \\ 0 \end{bmatrix} = \begin{bmatrix} (-\frac{1}{8})(-8) + (\frac{1}{24})(0) \\ (-\frac{1}{16})(-8) + (-\frac{7}{48})(0) \end{bmatrix} = \begin{bmatrix} 1 \\ \frac{1}{2} \end{bmatrix}$$

$(1, \frac{1}{2})$

45.  $-5x - y = 2$

$10x + 3y = 1$

$$\begin{bmatrix} -5 & -1 \\ 10 & 3 \end{bmatrix}$$

$$A^{-1} = \frac{1}{-15 + 10} \begin{bmatrix} 3 & 1 \\ -10 & -5 \end{bmatrix} = \begin{bmatrix} -\frac{3}{5} & -\frac{1}{5} \\ 2 & 1 \end{bmatrix}$$

$$\begin{bmatrix} -\frac{3}{5} & -\frac{1}{5} \\ 2 & 1 \end{bmatrix} \begin{bmatrix} 2 \\ 1 \end{bmatrix} = \begin{bmatrix} (-\frac{3}{5})(2) + (-\frac{1}{5})(1) \\ (2)(2) + (1)(1) \end{bmatrix} = \begin{bmatrix} -\frac{7}{5} \\ 5 \end{bmatrix}$$

$(-\frac{7}{5}, 5)$

46.  $-6x + 5y = -2$

$4x - 3y = 2$

$$\begin{bmatrix} -6 & 5 \\ 4 & -3 \end{bmatrix}$$

$$A^{-1} = \frac{1}{18 - 20} \begin{bmatrix} -3 & -5 \\ -4 & -6 \end{bmatrix} = \begin{bmatrix} \frac{3}{2} & \frac{5}{2} \\ 2 & 3 \end{bmatrix}$$

$$\begin{bmatrix} \frac{3}{2} & \frac{5}{2} \\ 2 & 3 \end{bmatrix} \begin{bmatrix} -2 \\ 2 \end{bmatrix} = \begin{bmatrix} (\frac{3}{2})(-2) + (\frac{5}{2})(2) \\ (2)(-2) + (3)(2) \end{bmatrix} = \begin{bmatrix} 2 \\ 2 \end{bmatrix}$$

$(2, 2)$

47. 
$$\begin{bmatrix} 5 & -1 & -3 \\ 6 & -1 & -4 \\ -2 & 0.5 & 1.5 \end{bmatrix} \begin{bmatrix} 5 \\ -8 \\ 10 \end{bmatrix}$$

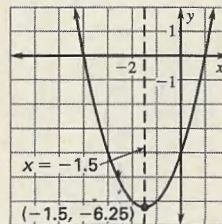
$$= \begin{bmatrix} (5)(5) + (-1)(-8) + (-3)(10) \\ (6)(5) + (-1)(-8) + (-4)(10) \\ (-2)(5) + (0.5)(-8) + (1.5)(10) \end{bmatrix}$$

$$= \begin{bmatrix} 25 + 8 - 30 \\ 30 + 8 - 40 \\ -10 - 4 + 15 \end{bmatrix} = \begin{bmatrix} 3 \\ -2 \\ 1 \end{bmatrix}$$

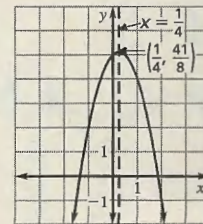
$(3, -2, 1)$

### Chapter 5 (pp. 945-947)

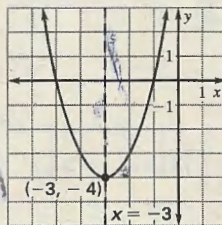
1.



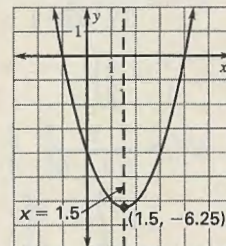
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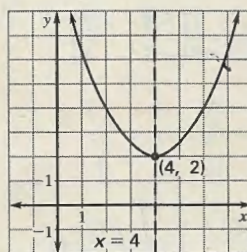
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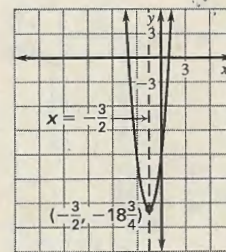
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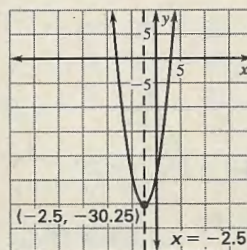
5.



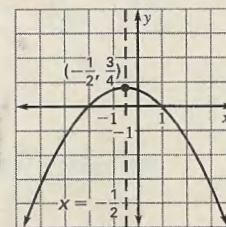
6.



7.



8.





## Extra Practice *continued*

9.  $F = 1.35s^2$   
 $0 = 1.35s^2$   
 $0 = s$   
 0 miles per hour
10.  $x^2 + 8x + 15 = (x + 5)(x + 3)$
11.  $m^2 - 9m + 20 = (m - 4)(m - 5)$
12.  $3x^2 + 11x - 4 = (3x - 1)(x + 4)$
13.  $6x^2 + 5x - 6 = (3x - 2)(2x + 3)$
14.  $9a^2 - 56a + 12 = (9a - 2)(a - 6)$
15.  $4u^2 - 4u - 35 = (2u + 5)(2u - 7)$
16.  $n^2 - 49 = (n + 7)(n - 7)$
17.  $x^2 - 10x + 25 = (x - 5)^2$
18.  $16m^2 - 24m + 9 = (4m - 3)^2$
19.  $4x^2 - 2x - 20 = 2(2x^2 - x - 10)$   
 $= 2(2x - 5)(x + 2)$
20.  $3p^2 + 15p - 42 = 3(p^2 + 5p - 14)$   
 $= 3(p + 7)(p - 2)$
21.  $6x^2 + 13x - 25$   
 cannot be factored
22.  $x^2 + 10x + 21 = 0$   
 $(x + 7)(x + 3) = 0$   
 $x = -7$  or  $x = -3$
23.  $2x^2 - 13x - 7 = 0$   
 $(2x + 1)(x - 7) = 0$   
 $x = -\frac{1}{2}$  or  $x = 7$
24.  $3(x^2 - 8x - 9) = 0$   
 $3(x - 9)(x + 1) = 0$   
 $x = 9$  or  $x = -1$
25.  $25m^2 - 20m + 4 = 0$   
 $(5m - 2)^2 = 0$   
 $m = \frac{2}{5}$
26.  $x^2 - 8x + 15 = 0$   
 $(x - 3)(x - 5) = 0$   
 $x = 3$  or  $x = 5$
27.  $6k^2 + 5k - 4 = 0$   
 $(3k + 4)(2k - 1) = 0$   
 $k = -\frac{4}{3}$  or  $k = \frac{1}{2}$
28.  $12x^2 - 3x - 36 = 0$   
 $x = \frac{3 \pm \sqrt{9 + 1728}}{24}$   
 $x \approx \frac{3 \pm 41.7}{24}$   
 $x \approx 1.86$  or  $x \approx -1.61$
29.  $12q^2 + 17q - 40 = 0$   
 $(3q + 8)(4q - 5) = 0$   
 $q = -\frac{8}{3}$  or  $q = \frac{5}{4}$
30.  $y = x^2 + 10x + 9$   
 $y = (x + 9)(x + 1);$   
 $-9, -1$
31.  $y = x^2 - 5x$   
 $y = x(x - 5);$   
 $0, 5$
32.  $y = 2x^2 + 3x - 2$   
 $y = (2x - 1)(x + 2);$   
 $\frac{1}{2}, -2$
33.  $y = 6(x^2 - 4)$   
 $y = 6(x + 2)(x - 2);$   
 $-2, 2$
34.  $y = 4(x^2 - 3x + 2)$   
 $y = 4(x - 1)(x - 2);$   
 $1, 2$
35.  $y = 5x^2 - 13x + 6$   
 $y = (5x - 3)(x - 2);$   
 $\frac{3}{5}, 2$
36.  $y = 2(2x^2 + 11x + 12)$   
 $y = 2(2x + 3)(x + 4);$   
 $-\frac{3}{2}, -4$
37.  $y = 7(x^2 - 9)$   
 $y = 7(x + 3)(x - 3);$   
 $-3, 3$
38.  $\sqrt{32} = \sqrt{4 \cdot 4 \cdot 2}$   
 $= 4\sqrt{2}$
39.  $\sqrt{125} = \sqrt{5 \cdot 5 \cdot 5} = 5\sqrt{5}$
40.  $3\sqrt{27} \cdot \sqrt{3} = 3\sqrt{3 \cdot 3 \cdot 3} \cdot \sqrt{3} = 3 \cdot 3 \cdot 3 = 27$
41.  $\sqrt{243} = \sqrt{9 \cdot 9 \cdot 3} = 9\sqrt{3}$
42.  $\sqrt{15} \cdot \sqrt{3} = \sqrt{5 \cdot 3} \cdot \sqrt{3} = 3\sqrt{5}$
43.  $\sqrt{\frac{81}{125}} = \sqrt{\frac{9 \cdot 9}{5 \cdot 5 \cdot 5}} \cdot \frac{\sqrt{5}}{\sqrt{5}} = \frac{9\sqrt{5}}{25}$
44.  $6\sqrt{5} \cdot \sqrt{5} = 30$
45.  $\sqrt{\frac{16}{25}} = \frac{4}{5}$
46.  $x^2 = 144$   
 $x = \pm 12$
47.  $x^2 = 160$   
 $x = \pm 4\sqrt{10}$
48.  $2x^2 = 400$   
 $x^2 = 200$   
 $x = \pm 10\sqrt{2}$
49.  $-4(x + 2)^2 = -20$   
 $(x + 2)^2 = 5$   
 $x + 2 = \pm\sqrt{5}$   
 $x = -2 \pm \sqrt{5}$
50.  $\frac{x^2}{9} = 6$   
 $x^2 = 54$   
 $x = \pm 3\sqrt{6}$
51.  $7x^2 = 175$   
 $x^2 = 25$   
 $x = \pm 5$
52.  $x^2 - 100 = -82$   
 $x^2 = 18$   
 $x = \pm 3\sqrt{2}$
53.  $(x - 4)^2 = 9$   
 $x - 4 = \pm 3$   
 $x = 4 \pm 3$   
 $x = 7$  or  $x = 1$
54.  $x^2 = -16$   
 $x = \pm 4i$
55.  $x^2 = -10$   
 $x = \pm i\sqrt{10}$
56.  $x^2 = -9$   
 $x = \pm 3i$
57.  $x^2 = -25$   
 $x = \pm 5i$
58.  $(y - 3)^2 = -49$   
 $y - 3 = \pm 7i$   
 $y = 3 \pm 7i$
59.  $x^2 = -36$   
 $x = \pm 6i$
60.  $(x + 5)^2 = -2$   
 $x + 5 = \pm i\sqrt{2}$   
 $x = -5 \pm i\sqrt{2}$
61.  $(r + 1)^2 = -20$   
 $r + 1 = \pm 2i\sqrt{5}$   
 $r = -1 \pm 2i\sqrt{5}$
62.  $(3 + 5i) + (2 + i) = 5 + 6i$
63.  $(-6 + 4i) + (2 - 7i) = -4 - 3i$
64.  $(4 + 3i)^2 = (16 - 9) + (12i + 12i) = 7 + 24i$
65.  $(15 - 7i) - (15 - 7i) = (15 - 15) + (7i - 7i) = 0$
66.  $i(5 + i) = 5i - 1 = -1 + 5i$
67.  $-2i(3 - 2i) = -6i - 4 = -4 - 6i$
68.  $(9 - 2i)(9 + 2i) = (81 + 4) + (-18i + 18i) = 85$
69.  $(9 - 5i) + (2 - 6i) = 11 - 11i$



## Extra Practice *continued*

70.  $(10 - 7i)(10 - 7i) = (100 - 49) + (-70i - 70i)$   
 $= 51 - 140i$
71.  $\frac{3}{5+i} \times \frac{5-i}{5-i} = \frac{15-3i}{25+1} = \frac{15-3i}{26} = \frac{15}{26} - \frac{3}{26}i$
72.  $\frac{2i}{4-i} \times \frac{4+i}{4+i} = \frac{-2+8i}{16+1} = \frac{-2+8i}{17} = -\frac{2}{17} + \frac{8}{17}i$
73.  $\frac{1-i}{1+i} \times \frac{1-i}{1-i} = \frac{1-2i-1}{1+1} = \frac{-2i}{2} = -i$
74.  $(x^2 - 6x + 9) = 7 + 9$       75.  $x^2 - 4x + 4 = -8 + 4$   
 $(x-3)^2 = 16$                        $(x-2)^2 = -4$   
 $x-3 = \pm 4$                            $x-2 = \pm 2i$   
 $x = 3 \pm 4$                                $x = 2 \pm 2i$   
 $x = 7$  or  $x = -1$
76.  $x^2 - 10x + 25 = 1 + 25$   
 $(x-5)^2 = 26$   
 $x-5 = \pm\sqrt{26}$   
 $x = 5 \pm \sqrt{26}$
77.  $m^2 + 2.6m + 1.69 = 3 + 1.69$   
 $(m+1.3)^2 = 4.69$   
 $m+1.3 = \pm\sqrt{4.69}$   
 $m = -1.3 \pm \sqrt{4.69}$   
 $m \approx 0.866$  or  $m \approx -3.47$
78.  $2(n^2 - \frac{5}{2}n + \frac{25}{16}) = 7 + \frac{25}{8}$   
 $2(n - \frac{5}{4})^2 = \frac{81}{8}$   
 $(n - \frac{5}{4})^2 = \frac{81}{16}$   
 $n - \frac{5}{4} = \pm\frac{9}{4}$   
 $n = \frac{5}{4} \pm \frac{9}{4}$   
 $n = \frac{7}{2}$  or  $n = -1$
79.  $3(n^2 - \frac{4}{3}n + \frac{4}{9}) = 4 + \frac{4}{3}$   
 $3(n - \frac{2}{3})^2 = \frac{16}{3}$   
 $(n - \frac{2}{3})^2 = \frac{16}{9}$   
 $n - \frac{2}{3} = \pm\frac{4}{3}$   
 $n = \frac{2}{3} \pm \frac{4}{3}$   
 $n = 2$  or  $n = -\frac{2}{3}$
80.  $3y^2 + 6y = 5$   
 $3(y^2 + 2y + 1) = 5 + 3$   
 $3(y+1)^2 = 8$   
 $(y+1)^2 = \frac{8}{3}$   
 $y+1 = \pm\frac{2\sqrt{6}}{3}$   
 $y = -1 \pm \frac{2\sqrt{6}}{3}$

81.  $5(n^2 + \frac{6}{5}n + \frac{9}{25}) = 8 + \frac{9}{5}$   
 $5(n + \frac{3}{5})^2 = \frac{49}{5}$   
 $(n + \frac{3}{5})^2 = \frac{49}{25}$   
 $n + \frac{3}{5} = \pm\frac{7}{5}$   
 $n = -\frac{3}{5} \pm \frac{7}{5}$   
 $n = -2$  or  $n = \frac{4}{5}$
82.  $x(40 - 2x) = 140$   
 $2x^2 - 40x = -140$   
 $(x^2 - 20x + 100) = 30$   
 $(x-10)^2 = 30$   
 $x-10 = \pm\sqrt{30}$   
 $x = 10 \pm \sqrt{30}$

about 15.5 ft by 9 ft

83.  $4x^2 + x - 3 = 0$       84.  $x^2 + 10x + 25 = 0$   
 $x = \frac{-1 \pm \sqrt{1+48}}{8}$                        $x = \frac{-10 \pm \sqrt{100-100}}{2}$   
 $x = \frac{-1 \pm \sqrt{49}}{8}$                        $x = \frac{-10}{2}$   
 $x = \frac{-1 \pm 7}{8}$                            $x = -5$   
 $x = -1$  or  $\frac{3}{4}$
85.  $x^2 + 3x - 8 = 0$       86.  $x^2 - 4x + 5 = 0$   
 $x = \frac{-3 \pm \sqrt{9+32}}{2}$                        $x = \frac{4 \pm \sqrt{16-20}}{2}$   
 $x = \frac{-3 \pm \sqrt{41}}{2}$                            $x = \frac{4 \pm 2i}{2}$   
 $x = 2 \pm i$

87.  $7m^2 - 6m + 10$   
 $m = \frac{6 \pm \sqrt{36-280}}{14}$   
 $m = \frac{6 \pm \sqrt{-244}}{14}$   
 $m = \frac{3 \pm i\sqrt{61}}{7}$
88.  $2(m^2 + 2m + 1) = 3m + 7$   
 $2m^2 + 4m + 2 = 3m + 7$   
 $2m^2 + m - 5 = 0$   
 $m = \frac{-1 \pm \sqrt{41}}{4}$   
 $m = \frac{-1 \pm \sqrt{1+40}}{4}$
89.  $7^2 - 4(1)(12) = 49 - 48 = 1$   
 2; real

90.  $(-8)^2 - 4(1)(16) = 64 - 64 = 0$   
 1; real



## Extra Practice *continued*

91.  $3^2 - 4(5)(10) = 9 - 200 = -191$

2; imaginary

92.  $5^2 - 4(1)(-6) = 25 + 24 = 49$

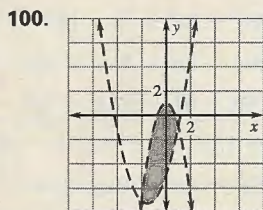
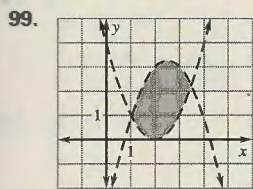
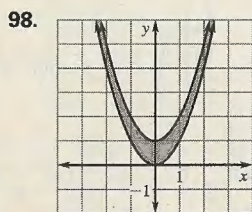
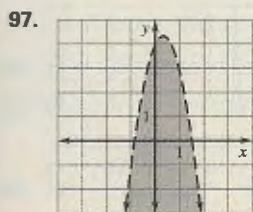
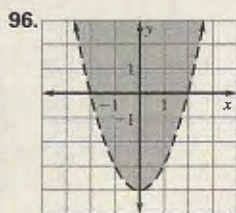
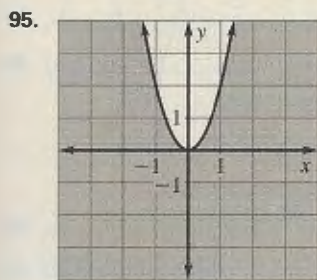
2; real

93.  $(-4)^2 - 4(2)(7) = 16 - 56 = -40$

2; imaginary

94.  $3^2 - 4(4)(-15) = 9 + 240 = 249$

2; real



101.  $y = a(x - 1)^2 + 1$

$$2 = a(2 - 1)^2 + 1$$

$$1 = a$$

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

103.  $y = a(x - 2)^2 + 1$

$$2 = a(5 - 2)^2 + 1$$

$$1 = 9a$$

$$\frac{1}{9} = a$$

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

105.  $y = a(x + 3)^2 - 5$

$$27 = a(1 + 3)^2 - 5$$

$$32 = 16a$$

$$2 = a$$

$$y = 2(x + 3)^2 - 5$$

102.  $y = a(x - 1)^2 + 2$

$$4 = a(2 - 1)^2 + 2$$

$$2 = a$$

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

104.  $y = a(x - 3)^2$

$$1 = a(2 - 3)^2$$

$$1 = a$$

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

106.  $y = a(x + 1)^2 - 4$

$$-6 = a(-2 + 1)^2 - 4$$

$$-2 = a$$

$$y = -2(x + 1)^2 - 4$$

107.  $y = a(x - 2)(x - 6)$  108.  $y = a(x + 1)(x - 3)$

$$-3 = a(5 - 2)(5 - 6) \quad 3 = a(2 + 1)(2 - 3)$$

$$-3 = a(3)(-1) \quad 3 = a(3)(-1)$$

$$1 = a$$

$$-1 = a$$

$$y = (x - 2)(x - 6) \quad y = -(x + 1)(x - 3)$$

109.  $y = a(x + 0)(x - 4)$  110.  $y = a(x + 2)(x - 3)$

$$-6 = a(1 + 0)(1 - 4) \quad 1 = a(2 + 2)(2 - 3)$$

$$-6 = a(1)(-3) \quad 1 = a(4)(-1)$$

$$2 = a$$

$$-\frac{1}{4} = a$$

$$y = 2x(x - 4) \quad y = -\frac{1}{4}(x + 2)(x - 3)$$

111.  $y = a(x - 1)(x - 2)$  112.  $y = a(x + 1)(x - 4)$

$$9 = a(5 - 1)(5 - 2) \quad -1 = a(0 + 1)(0 - 4)$$

$$9 = a(4)(3) \quad -1 = a(1)(-4)$$

$$\frac{3}{4} = a$$

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

$$y = \frac{3}{4}(x - 1)(x - 2) \quad y = \frac{1}{4}(x + 1)(x - 4)$$

113.  $y = a(x - 5)(x + 2)$

$$2 = a(2 - 5)(2 + 2)$$

$$2 = a(-3)(4)$$

$$-\frac{1}{6} = a$$

$$y = -\frac{1}{6}(x - 5)(x + 2)$$

114.  $y = a(x + 3)^2$

$$48 = a(1 + 3)^2$$

$$48 = a(4)^2$$

$$3 = a$$

$$y = 3(x + 3)^2$$

### Chapter 6 (pp. 947-949)

1. 625; product of powers 2. 256; product of powers

3. 512; power of a power 4.  $\frac{1}{36}$ ; negative exponent

5.  $\frac{16}{25}$ ; power of a quotient

6.  $\frac{49}{9}$ ; negative exponent, power of a quotient

7.  $\frac{1}{512}$ ; zero exponent, negative exponent

8. 9; *Sample answer*: quotient of powers

9.  $\frac{1}{46,656}$ ; *Sample answer*: product of powers, power of a quotient

10. 729; *Sample answer*: power of a power, negative exponent

11. 6; zero exponent, quotient of powers

12. 25; *Sample answer*: product of powers

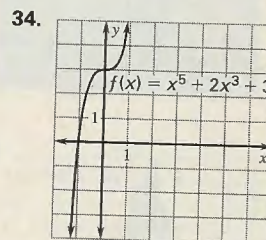
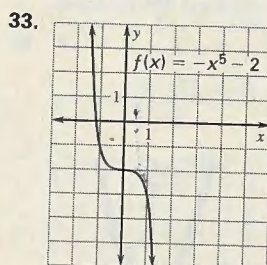
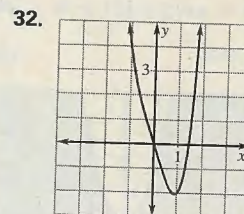
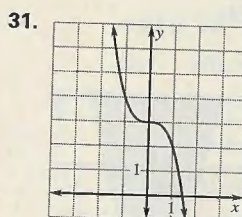
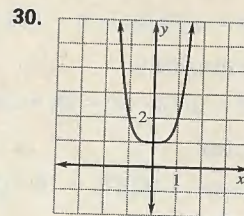
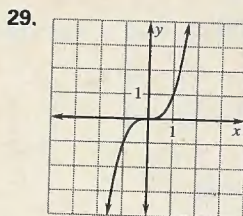
13.  $1,048,576x^8$ ; power of a product, power of a power

14.  $\frac{1}{x^6y^6}$ ; power of a product, power of a power, negative exponent



## Extra Practice *continued*

15.  $x^3$ ; quotient of powers
16.  $\frac{y^4}{2x}$ ; quotient of powers
17.  $\frac{1}{36x^6y^8}$ ; power of a product, power of a power, negative exponent
18.  $\frac{-4y^4}{x^{10}}$ ; power of a product, power of a power, negative exponent
19.  $\frac{-1}{2187x^{63}y^{21}}$ ; power of a product, power of a power, negative exponent
20.  $\frac{x^{24}y^8}{1,679,616}$ ; power of a product, power of a power, negative exponent
21.  $\frac{1}{64x^{12}y^{16}}$ ; power of a product, power of a power, negative exponent
22.  $\frac{2x^3}{3y^2}$ ; quotient of powers, negative exponent
23.  $\frac{3x^8}{y^5}$ ; product of powers, quotient of powers, negative exponent
24.  $6x^3y^2$ ; *Sample answer:* product of powers, quotient of powers, zero exponent
25. 
$$\begin{array}{r|rrrr} 2 & 2 & 3 & -5 & 1 \\ & & 4 & 14 & 18 \\ \hline & 2 & 7 & 9 & 19 \end{array}$$
  
 $f(2) = 19$
26. 
$$\begin{array}{r|rrrr} -1 & 10 & -5 & 0 & 4 \\ & & -10 & 15 & -15 \\ \hline & 10 & -15 & 15 & -11 \end{array}$$
  
 $f(-1) = -11$
27. 
$$\begin{array}{r|rrrrrr} -2 & 1 & 0 & -3 & 0 & -2 & 0 \\ & & -2 & 4 & -2 & 4 & -4 \\ \hline & 1 & -2 & 1 & -2 & 2 & -4 \end{array}$$
  
 $f(-2) = -4$
28. 
$$\begin{array}{r|rrrr} 3 & -1 & 0 & 0 & 7 & -12 \\ & & -3 & -9 & -27 & -60 \\ \hline & -1 & -3 & -9 & -20 & -72 \end{array}$$
  
 $f(3) = -72$



35.  $(2x^2 + 6x + 3) + (3x^2 + 4x + 4) = 5x^2 + 10x + 7$
36.  $(4x - 3) + (3 - 8x) = -4x$
37.  $(5x^3 - 2x^2 + 7) - (8x^2 - 11) = 5x^3 - 10x^2 + 18$
38.  $(9x^3 - 7x^2 + 8) + (-8x^3 + 5x^2 - 15) = x^3 - 2x^2 - 7$
39.  $(29x - 8) + (15x^3 + 9x^2 - 8)$   
 $= 15x^3 + 9x^2 + 29x - 16$
40.  $(6x^3 - 7x^4 + 10x) - (4x^3 - 6x^2)$   
 $= -7x^4 + 2x^3 + 6x^2 + 10x$
41.  $(x + 7)(x - 5) = x^2 - 5x + 7x - 35$   
 $= x^2 + 2x - 35$
42.  $(x - 3)^2 = x^2 - 3x - 3x + 9$   
 $= x^2 - 6x + 9$
43.  $(5 - 3x)(x + 1)(x + 6)$   
 $= (5 - 3x)(x^2 + 7x + 6)$   
 $= 5x^2 + 35x + 30 - 3x^3 - 21x^2 - 18x$   
 $= -3x^3 - 16x^2 + 17x + 30$
44.  $(-x^3 - 3)(x^2 - 5x + 4)$   
 $= -x^5 + 5x^4 - 4x^3 - 3x^2 + 15x - 12$
45.  $6x(2x^3 - 4x^2 + 7) = 12x^4 - 24x^3 + 42x$
46.  $(x + 12)(2x^2 - 3x + 5)$   
 $= 2x^3 - 3x^2 + 5x + 24x^2 - 36x + 60$   
 $= 2x^3 + 21x^2 - 31x + 60$



## Extra Practice continued

$$\begin{aligned}
 47. (2x + 8)^3 &= (2x + 8)(2x + 8)(2x + 8) \\
 &= (2x + 8)(4x^2 + 32x + 64) \\
 &= 8x^3 + 64x^2 + 128x + 32x^2 + 256x + 512 \\
 &= 8x^3 + 96x^2 + 384x + 512
 \end{aligned}$$

$$\begin{aligned}
 48. (x + 1)(3x + 3)(2x + 3) &= (x + 1)(6x^2 + 15x + 9) \\
 &= 6x^3 + 15x^2 + 9x + 6x^2 + 15x + 9 \\
 &= 6x^3 + 21x^2 + 24x + 9
 \end{aligned}$$

$$\begin{aligned}
 49. (x + y)^3 &= (x + y)(x + y)(x + y) \\
 &= (x + y)(x^2 + 2xy + y^2) \\
 &= x^3 + 2x^2y + xy^2 + x^2y + 2xy^2 + y^3 \\
 &= x^3 + 3x^2y + 3xy^2 + y^3
 \end{aligned}$$

$$50. x^3 - 27 = (x - 3)(x^2 + 3x + 9)$$

$$51. 2x^3 + 250 = 2(x^3 + 125) = 2(x + 5)(x^2 - 5x + 25)$$

$$\begin{aligned}
 52. 256x^5 - 81x^3 &= x^3(256x^2 - 81) \\
 &= x^3(16x + 9)(16x - 9)
 \end{aligned}$$

$$53. x^3 + 7x^2 + 15x + 9 = (x + 1)(x + 3)^2$$

$$\begin{aligned}
 54. x^3 - x^2 - 14x + 24 &= (x - 2)(x^2 + x - 12) = (x - 2)(x - 3)(x + 4)
 \end{aligned}$$

$$55. 3x^3 - 24 = 3(x^3 - 8) = 3(x - 2)(x^2 + 2x + 4)$$

$$\begin{aligned}
 56. x^3 + 5x^2 + 8x + 40 &= x^2(x + 5) + 8(x + 5) \\
 &= (x^2 + 8)(x + 5)
 \end{aligned}$$

$$\begin{aligned}
 57. 2x^3 + 18x^2 - 5x - 45 &= 2x^2(x + 9) - 5(x + 9) \\
 &= (2x^2 - 5)(x + 9)
 \end{aligned}$$

$$\begin{aligned}
 58. 3x^5 + 6x^3 - 45x &= 3x(x^4 + 2x^2 - 15) = 3x(x^2 + 5)(x^2 - 3)
 \end{aligned}$$

$$\begin{aligned}
 59. \text{width} &= h - 1 \\
 \text{length} &= h + 3 \\
 \text{height} &= h \\
 6 &= (h - 1)(h + 3)h \\
 6 &= h^3 + 2h^2 - 3h \\
 h^3 + 2h^2 - 3h - 6 &= 0 \\
 h^2(h + 2) - 3(h + 2) &= 0 \\
 (h^2 - 3)(h + 2) &= 0 \\
 h &= \sqrt{3} \\
 \text{height} &= \sqrt{3} \text{ in.} \\
 \text{length} &= 3 + \sqrt{3} \text{ in.} \\
 \text{width} &= \sqrt{3} - 1 \text{ in.}
 \end{aligned}$$

$$\begin{array}{r|rrrr}
 60. 1 & 1 & -2 & -8 & 5 \\
 & & 1 & -1 & -9 \\
 \hline
 & & & 1 & -1 & -9 & -4 \\
 & & & & & 4 & \\
 \hline
 & & & & & & x^2 - x - 9 - \frac{4}{x-1}
 \end{array}$$

$$\begin{array}{r|rrrr}
 61. 4 & 1 & -10 & 27 & -12 \\
 & & 4 & -24 & 12 \\
 \hline
 & & & 1 & -6 & 3 & 0 \\
 & & & & & & x^2 - 6x + 3
 \end{array}
 \qquad
 \begin{array}{r|rr}
 62. 2 & 5 & 0 & -6 \\
 & & 10 & 20 \\
 \hline
 & & & 5 & 10 & 14 \\
 & & & & & \frac{14}{x-2} \\
 \hline
 & & & & & 5x + 10 + \frac{14}{x-2}
 \end{array}$$

$$\begin{array}{r|rrrrr}
 63. -4 & 3 & -17 & 13 & -24 & 16 \\
 & & -12 & 116 & -516 & 2160 \\
 \hline
 & & & 3 & -29 & 129 & -540 & 2176 \\
 & & & & & & & \frac{2176}{x+4} \\
 \hline
 & & & & & & & 3x^3 - 29x^2 + 129x - 540 + \frac{2176}{x+4}
 \end{array}$$

$$\begin{array}{r|rrrrr}
 64. -1 & 1 & 1 & 0 & -3 & -3 \\
 & & -1 & 0 & 0 & 3 \\
 \hline
 & & & 1 & 0 & 0 & -3 & 0 \\
 & & & & & & & x^3 - 3
 \end{array}$$

$$\begin{array}{r|rrrrr}
 65. 2 & 4 & -5 & 2 & -1 & 5 \\
 & & 8 & 6 & 16 & 30 \\
 \hline
 & & & 4 & 3 & 8 & 15 & 35 \\
 & & & & & & & \frac{35}{x-2} \\
 \hline
 & & & & & & & 4x^3 + 3x^2 + 8x + 15 + \frac{35}{x-2}
 \end{array}$$

$$\begin{aligned}
 66. f(x) &= x^3 - 2x^2 - 11x + 12 \\
 &= (x + 3)(x^2 - 5x + 4) \\
 &= (x + 3)(x - 1)(x - 4) \\
 x &= -3, 1, 4
 \end{aligned}$$

$$\begin{aligned}
 67. f(x) &= x^4 + 5x^3 + 10x^2 + 20x + 24 \\
 &= (x + 3)(x^3 + 2x^2 + 4x + 8) \\
 &= (x + 3)(x + 2)(x^2 + 4) \\
 x &= -3, -2
 \end{aligned}$$

$$\begin{aligned}
 68. f(x) &= 2x^3 - 3x^2 - 23x + 12 \\
 &= (x + 3)(2x^2 - 9 + 4) \\
 &= (x + 3)(2x - 1)(x - 4) \\
 x &= -3, \frac{1}{2}, 4
 \end{aligned}$$

$$\begin{aligned}
 69. f(x) &= x^5 + x^4 + 3x^3 - 8x^2 - 8x - 24 \\
 &= (x - 2)(x^4 + 3x^3 + 9x^2 + 10x + 12) \\
 x &= 2
 \end{aligned}$$

$$\begin{aligned}
 70. f(x) &= 3x^4 - 5x^3 - 5x^2 + 5x + 2 \\
 &= (x + 1)(3x^3 - 8x^2 + 3x + 2) \\
 &= (x + 1)(x - 1)(3x^2 - 5x - 2) \\
 &= (x + 1)(x - 1)(x - 2)(3x + 1) \\
 x &= -1, 1, 2, -\frac{1}{3}
 \end{aligned}$$

$$\begin{aligned}
 71. f(x) &= 16x^3 + 80x^2 + x + 5 \\
 &= (x + 5)(16x^2 + 1) \\
 x &= -5
 \end{aligned}$$



## Extra Practice *continued*

$$72. f(x) = x^3 - x^2 + 4x - 4$$

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

$$x = 1, \pm 2i$$

$$73. f(x) = x^4 - 7x^3 + 17x^2 - 17x + 6$$

$$= (x - 1)(x^3 - 6x^2 + 11x - 6)$$

$$= (x - 1)^2(x^2 - 5x + 6)$$

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

$$x = 1, 2, 3$$

$$74. f(x) = x^3 + x^2 + 9x + 9$$

$$= (x^2 + 9)(x + 1)$$

$$x = \pm 3i, -1$$

$$75. f(x) = x^4 + 2x^3 - 12x^2 - 40x - 32$$

$$= (x - 4)(x^3 + 6x^2 + 12x + 8)$$

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

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

$$x = 4, -2$$

$$76. f(x) = x^3 - 7x^2 - x + 7$$

$$= (x - 7)(x^2 - 1)$$

$$= (x - 7)(x - 1)(x + 1)$$

$$x = 7, 1, -1$$

$$77. f(x) = x^4 - 6x^2 + 5$$

$$= (x^2 - 1)(x^2 - 5)$$

$$= (x + 1)(x - 1)(x^2 - 5)$$

$$x = -1, 1, \pm\sqrt{5}$$

$$78. x = 3, 1, 5$$

$$f(x) = (x - 3)(x - 1)(x - 5)$$

$$= (x^2 - 4x + 3)(x - 5)$$

$$= x^3 - 9x^2 + 23x - 15$$

$$79. x = -1, -2, -2$$

$$f(x) = (x + 1)(x + 2)^2$$

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

$$= x^3 + 5x^2 + 8x + 4$$

$$80. x = 4, 6, -7$$

$$f(x) = (x - 4)(x - 6)(x + 7)$$

$$= (x^2 - 10x + 24)(x + 7)$$

$$= x^3 - 3x^2 - 46x + 168$$

$$81. x = i, -i, 3$$

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

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

$$82. x = i, -i, 4i, -4i$$

$$f(x) = (x^2 + 1)(x^2 + 16)$$

$$= x^4 + 17x^2 + 16$$

$$83. x = 2, 1 + i, 1 - i$$

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

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

$$= x^3 - 4x^2 + 6x - 4$$

$$84. x = 6i, 6i, -6i, -6i$$

$$f(x) = (x^2 + 36)(x^2 + 36)$$

$$= x^4 + 72x^2 + 1296$$

$$85. x = 3, -2, -1 + i, -1 - i$$

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

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

$$= x^4 + x^3 - 6x^2 - 14x - 12x$$

$$86. x = 4 - i, 4 + i, 5 - i, 5 + i,$$

$$f(x) = (x - 2)[(x - 4)^2 + 1][(x - 5)^2 + 1]$$

$$= (x - 2)(x^2 - 8x + 17)(x^2 - 10x + 26)$$

$$= (x - 2)(x^4 - 18x^3 + 123x^2 - 378x + 442)$$

$$= x^5 - 20x^4 + 159x^3 - 624x^2 + 1198x - 884$$

$$87. x = 2 + i, 2 - i, 6i, -6i$$

$$f(x) = [(x - 2)^2 + 1](x^2 + 36)$$

$$= (x^2 - 4x + 5)(x^2 + 36)$$

$$= x^4 - 4x^3 + 41x^2 - 144x + 180$$

$$88. x = 2, 3 - i, 3 + i$$

$$f(x) = (x - 2)^2[(x - 3)^2 + 1]$$

$$= (x^2 - 4x + 4)(x^2 - 6x + 10)$$

$$= x^4 - 10x^3 + 38x^2 - 64x + 40$$

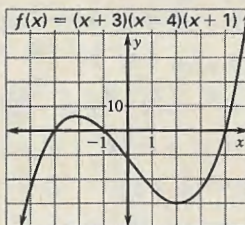
$$89. x = 5, -5, -6i, 6i, -5i$$

$$f(x) = (x^2 - 25)(x^2 + 36)(x^2 + 25)$$

$$= (x^4 - 625)(x^2 + 36)$$

$$= x^6 + 36x^4 - 625x^2 - 22,500$$

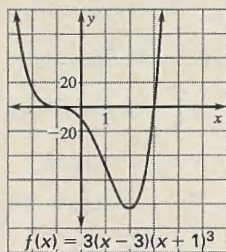
$$90. f(x) = (x + 3)(x - 4)(x + 1)$$



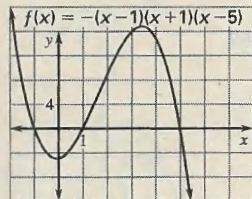


## Extra Practice *continued*

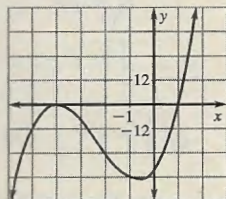
91.  $f(x) = 3(x - 3)(x + 1)^3$



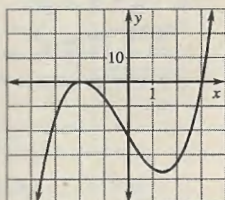
92.  $f(x) = -(x - 1)(x + 1)(x - 5)$



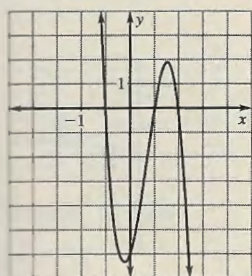
93.  $f(x) = 2(x - 1)(x + 4)^2$



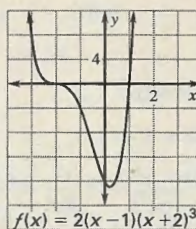
94.  $f(x) = 2(x - 3)(x + 2)^2$



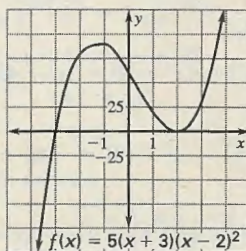
95.  $f(x) = -3(x + 1)(x - 1)(x - 2)$



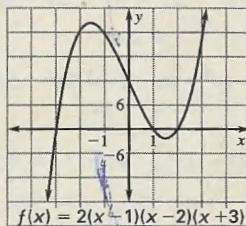
96.  $f(x) = 2(x - 1)(x + 2)^3$



97.  $f(x) = 5(x + 3)(x - 2)^2$



98.  $f(x) = 2(x - 1)(x - 2)(x + 3)$



99.  $y = \frac{1}{2}x^2 + \frac{3}{2}x$

100.  $y = x^3 + 2x^2 - 2x + 4$

101.  $y = x^3 - 3x^2 + 2x + 3$

102.  $y = 3x^3 - 4x^2 + 3x + 1$

### Chapter 7 (pp. 949-950)

1.  $\sqrt[3]{27} = 3$

2.  $\sqrt[3]{-125} = -5$

3.  $16^{-\frac{1}{2}} = \frac{1}{4}$

4.  $64^{\frac{2}{3}} = 4^2 = 16$

5.  $-(25^{\frac{3}{2}}) = -(5^3) = -125$

6.  $-(243^{\frac{2}{3}}) = -(3^3) = -27$

7.  $(\sqrt[4]{81})^{-2} = (3)^{-2} = \frac{1}{9}$

8.  $\sqrt[5]{32} = 2$

9.  $8^{\frac{1}{3}} = 2$

10.  $(-216)^{-\frac{1}{3}} = -\frac{1}{6}$

11.  $(\sqrt[3]{64})^{\frac{1}{2}} = 4^{\frac{1}{2}} = 2$

12.  $(\sqrt[3]{729})^{\frac{1}{2}} = (9)^{\frac{1}{2}} = 3$

13.  $5^{\frac{1}{2}} \cdot 5^{\frac{3}{2}} = 5^1 = 5$

14.  $(3^{\frac{1}{3}})^{\frac{3}{5}} = 3^{\frac{1}{5}}$

15.  $2^{\frac{1}{2}} \cdot 8^{\frac{1}{4}} = 2^{\frac{1}{2}} \cdot 2^{\frac{3}{4}} = 2$

16.  $\frac{12^{\frac{3}{5}}}{12^{\frac{2}{5}}} = 12^{\frac{1}{5}}$

17.  $\frac{80^{\frac{1}{2}}}{16^{\frac{1}{2}}} = \frac{4\sqrt{5}}{4} = \sqrt{5}$

18.  $\sqrt{25} \cdot \sqrt[3]{25} = 5 \sqrt[3]{25}$



## Extra Practice continued

19.  $(\sqrt[3]{7} \cdot \sqrt[4]{7})^2 = 7^{\frac{2}{3}} \cdot 7^{\frac{2}{4}} = 7 \sqrt[7]{7}$

20.  $\frac{\sqrt[4]{10}}{\sqrt[4]{10}} = 10^{(\frac{1}{4}-\frac{1}{4})} = \sqrt[4]{10}$

21.  $x^{\frac{1}{2}} \cdot x^{\frac{1}{2}} = x^{\frac{2}{2}} = x^1 = x$

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

23.  $\sqrt[4]{81x^6y^8} = 3xy^2 \sqrt[4]{x^2} = 3xy^2 \sqrt{x}$

24.  $\sqrt{\frac{16x^4y^5}{25z^4}} = \frac{4x^2y^2\sqrt{y}}{5z^2}$

25.  $\frac{\sqrt[3]{x} \cdot \sqrt{x^3}}{\sqrt{16x^{12}}} = \frac{x^{\frac{1}{3}} \cdot x^{\frac{3}{2}}}{4x^6} = \frac{\sqrt[6]{x^5}}{4x^5}$

26.  $\frac{\sqrt[5]{x^4}}{\sqrt[8]{x^3}} = x^{(\frac{4}{5}-\frac{3}{8})} = x^{\frac{17}{40}}$

27.  $\sqrt[3]{\frac{8x^6y^{12}}{27}} = \frac{2x^2y^4}{3}$

28.  $\sqrt[9]{9xy^6} \cdot \sqrt[9]{6x^{12}} = x^2y \sqrt[9]{54x}$

29.  $f(x) + g(x) = (x^2 - 4x + 5) + (x^2 - 9) = 2x^2 - 4x - 4;$

all real numbers

30.  $f(x) - g(x) = (x^2 - 4x + 5) - (x^2 - 9) = -4x + 14;$

all real numbers

31.  $g(x) + f(x) = (x^2 - 9) + (x^2 - 4x + 5) = 2x^2 - 4x - 4;$

all real numbers

32.  $g(x) - f(x) = (x^2 - 9) - (x^2 - 4x + 5) = 4x - 14;$

all real numbers

33.  $f(x) + f(x) = (x^2 - 4x + 5) + (x^2 - 4x + 5) = 2x^2 - 8x + 10;$

all real numbers

34.  $f(x) - f(x) = (x^2 - 4x + 5) - (x^2 - 4x + 5) = 0;$

all real numbers

35.  $g(x) + g(x) = (x^2 - 9) + (x^2 - 9) = 2x^2 - 18;$

all real numbers

36.  $g(x) - g(x) = (x^2 - 9) - (x^2 - 9) = 0;$

all real numbers

37.  $f(x) \cdot g(x) = (3x^{\frac{1}{3}})(x^{\frac{1}{2}}) = 3x^{\frac{5}{6}};$  nonnegative reals

38.  $\frac{f(x)}{g(x)} = \frac{3x^{\frac{1}{3}}}{x^{\frac{1}{2}}} = \frac{3}{x^{\frac{1}{6}}};$  positive reals

39.  $g(x) \cdot f(x) = x^{\frac{1}{2}} \cdot 3x^{\frac{1}{3}} = 3x^{\frac{5}{6}};$  nonnegative reals

40.  $\frac{g(x)}{f(x)} = \frac{x^{\frac{1}{2}}}{3x^{\frac{1}{3}}} = \frac{x^{\frac{1}{6}}}{3};$  nonnegative reals

41.  $f(g(x)) = f(x^{\frac{1}{2}}) = 3(x^{\frac{1}{2}})^{\frac{1}{3}} = 3x^{\frac{1}{6}};$  nonnegative reals

42.  $g(f(x)) = g(3x^{\frac{1}{3}}) = (3x^{\frac{1}{3}})^{\frac{1}{2}} = 3^{\frac{1}{2}}x^{\frac{1}{6}};$  nonnegative reals

43.  $f(f(x)) = f(3x^{\frac{1}{3}}) = 3(3x^{\frac{1}{3}})^{\frac{1}{3}} = 3^{\frac{4}{3}}x^{\frac{1}{9}};$  nonnegative reals

44.  $g(g(x)) = g(x^{\frac{1}{2}}) = (x^{\frac{1}{2}})^{\frac{1}{2}} = x^{\frac{1}{4}};$  nonnegative reals

45.  $y = 3x + 1$

46.  $y = -2x - 1$

$x = 3y + 1$

$x = -2y - 1$

$x - 1 = 3y$

$x + 1 = -2y$

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

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

47.  $y = -x - 4$

$x = -y - 4$

$f^{-1}(x) = y = -x - 4$

48.  $y = 5x - 7$

$x = 5y - 7$

$x + 7 = 5y$

$\frac{x+7}{5} = y = f^{-1}(x)$

49.  $y = 2x + 3$

$x = 2y + 3$

$x - 3 = 2y$

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

50.  $y = -4x - 5$

$x = -4y - 5$

$x + 5 = -4y$

$-\frac{x+5}{4} = y = f^{-1}(x)$

51.  $y = \frac{1}{2}x - 4$

$x = \frac{1}{2}y - 4$

$x + 4 = \frac{1}{2}y$

$2x + 8 = y = f^{-1}(x)$

52.  $y = 3x^3 + 2$

$x = 3y^3 + 2$

$x - 2 = 3y^3$

$\sqrt[3]{\frac{x-2}{3}} = y = f^{-1}(x)$

53.  $y = -\frac{1}{3}x + 5$

$x = -\frac{1}{3}y + 5$

$x - 5 = -\frac{1}{3}y$

$-3x + 15 = y = f^{-1}(x)$

54.  $y = 2x^4$

$x = 2y^4$

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

$\sqrt[4]{\frac{x}{2}} = y = f^{-1}(x)$

55.  $y = x^4 - \frac{1}{8}$

$x = y^4 - \frac{1}{8}$

$x + \frac{1}{8} = y^4$

$\sqrt[4]{x + \frac{1}{8}} = y = f^{-1}(x)$

56.  $y = \frac{1}{2}x^2 - 5$

$x = \frac{1}{2}y^2 - 5$

$x + 5 = \frac{1}{2}y^2$

$2x + 10 = y^2$

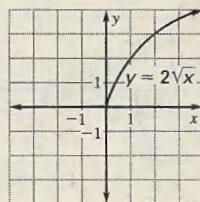
$\sqrt{2x + 10} = y = f^{-1}(x)$

57.  $A = \pi r^2$

$\frac{A}{\pi} = r^2$

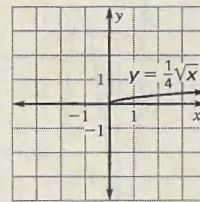
$\frac{\sqrt{A\pi}}{\pi} = r$

58.



$x \geq 0; y \geq 0$

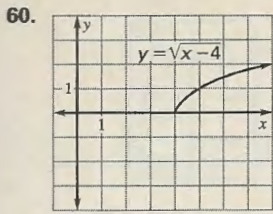
59.



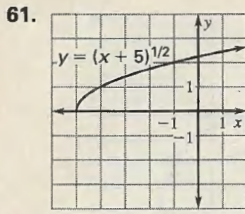
$x \geq 0; y \geq 0$



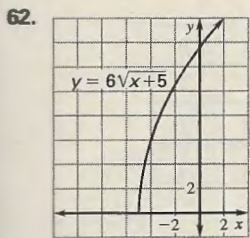
# Extra Practice *continued*



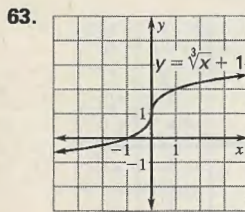
$$x \geq 4; y \geq 0$$



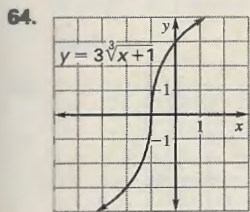
$$x \geq -5; y \geq 0$$



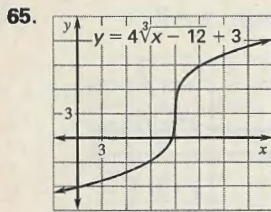
$$x \geq -5; y \geq 0$$



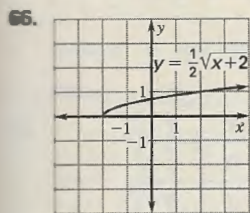
$$\text{all reals; all reals}$$



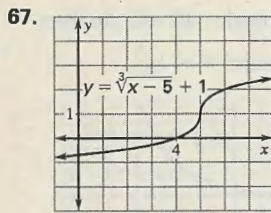
$$\text{all reals; all reals}$$



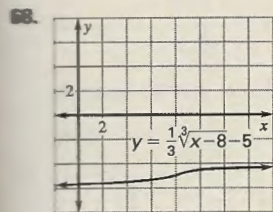
$$\text{all reals; all reals}$$



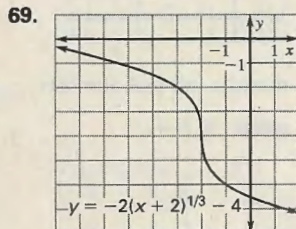
$$x \geq -2; y \geq 0$$



$$\text{all reals; all reals}$$



$$\text{all reals; all reals}$$



$$\text{all reals; all reals}$$

70.  $x^4 = \frac{1}{256}$   
 $x = \frac{1}{256^{\frac{1}{4}}}$   
 $= \frac{1}{4,294,967,296}$

71.  $x^4 - 81 = 0$   
 $x^4 = 81$   
 $x = 81^{\frac{1}{4}}$   
 $= 43,046,721$

72.  $2(x+1)^{\frac{2}{3}} = 6$   
 $(x+1)^{\frac{2}{3}} = 3$   
 $x+1 = \pm 3\sqrt{3}$   
 $x = -1 \pm 3\sqrt{3}$   
 $\approx 4.2, -6.2$

73.  $\sqrt{x} + 1 = \frac{1}{16}$   
 $\sqrt{x} = -\frac{15}{16}$   
 no solution

74.  $x^{\frac{2}{3}} = 16$   
 $x = (\sqrt[3]{16})^3$   
 $= 64$

75.  $\sqrt[3]{x} + 4 = 2$   
 $\sqrt[3]{x} = -2$   
 $x = -8$

76.  $\sqrt{11x+3} = 2x$   
 $11x+3 = 4x^2$   
 $4x^2 - 11x - 3 = 0$   
 $(4x+1)(x-3) = 0$   
 $x = -\frac{1}{4} \text{ or } x = 3$

77.  $\sqrt{x-13} = 2\sqrt{x+7}$   
 $x-13 = 4x+28$   
 $-41 = 3x$   
 $-\frac{41}{3} = x$

no solution

78.  $\sqrt{5x+1} = x-4$   
 $5x+1 = x^2 - 8x + 16$   
 $x^2 - 13x + 15 = 0$   
 $x = \frac{13 \pm \sqrt{169 - 4(15)}}{2}$   
 $= \frac{13 \pm \sqrt{109}}{2}$   
 $\approx 11.7$

79.  $\sqrt{x+3} = \sqrt{2x-7}$   
 $x+3 = 2x-7$   
 $10 = x$

80.  $2\sqrt{x-2} = \sqrt{x}$   
 $4x-8 = x$   
 $3x = 8$   
 $x = \frac{8}{3}$

81.  $4\sqrt{3x-7} = 2\sqrt{-x+73}$   
 $16(3x-7) = 4(-x+73)$   
 $48x - 112 = -4x + 292$   
 $52x = 404$   
 $x = \frac{101}{13}$

82. mean =  $\frac{97}{10} = 9.7$

83. mean =  $\frac{582}{10} = 58.2$

median =  $\frac{9+10}{2} = 9.5$

median =  $\frac{57+58}{2} = 57.5$

mode = 9

mode = 58

range =  $12 - 8 = 4$

range =  $73 - 52 = 21$

$\sigma = \sqrt{\frac{16.1}{10}} \approx 1.27$

$\sigma = \sqrt{\frac{275.6}{10}} \approx 5.25$

84. mean =  $\frac{28.2}{8} \approx 3.53$

85. mean =  $\frac{179.1}{7} \approx 25.6$

median =  $\frac{2.8+2.8}{2} = 2.8$  median = 21.3

mode = 2.8

mode = 18.6

range =  $5.2 - 2.3 = 2.9$

range =  $62 - 15.3 = 46.7$

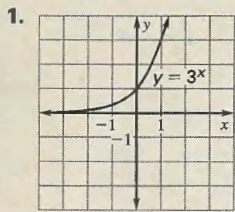
$\sigma \approx \sqrt{\frac{9.84}{8}} \approx 1.11$

$\sigma \approx \sqrt{\frac{1578.87}{7}} \approx 15.0$



# Extra Practice *continued*

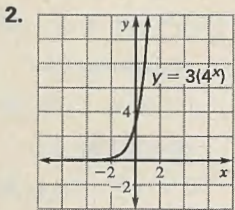
## Chapter 8 (pp. 950–952)



| x  | y             |
|----|---------------|
| 0  | 1             |
| 1  | 3             |
| -1 | $\frac{1}{3}$ |

domain: all real numbers

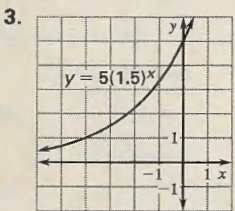
range:  $y > 0$



| x  | y             |
|----|---------------|
| 0  | 3             |
| 1  | 12            |
| -1 | $\frac{3}{4}$ |

domain: all real numbers

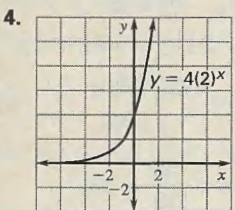
range:  $y > 0$



| x  | y              |
|----|----------------|
| 0  | 5              |
| 1  | 7.5            |
| -1 | $\frac{10}{3}$ |

domain: all real numbers

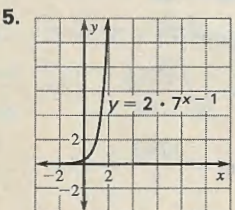
range:  $y > 0$



| x  | y |
|----|---|
| 0  | 4 |
| 1  | 8 |
| -1 | 2 |
| -2 | 1 |

domain: all real numbers

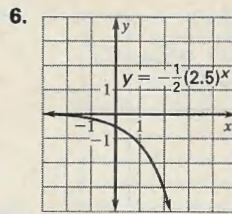
range:  $y > 0$



| x  | y              |
|----|----------------|
| 0  | $\frac{2}{7}$  |
| 1  | 2              |
| -1 | $\frac{2}{49}$ |

domain: all real numbers

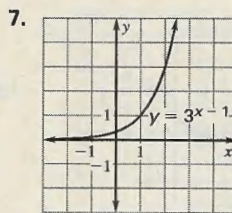
range:  $y > 0$



| x  | y              |
|----|----------------|
| 0  | $-\frac{1}{2}$ |
| 1  | $-\frac{5}{4}$ |
| -1 | $-\frac{1}{5}$ |

domain: all real numbers

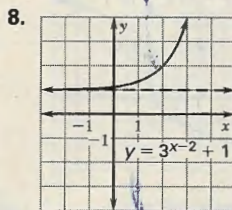
range:  $y < 0$



| x  | y             |
|----|---------------|
| 0  | $\frac{1}{3}$ |
| 1  | 1             |
| -1 | $\frac{1}{9}$ |

domain: all real numbers

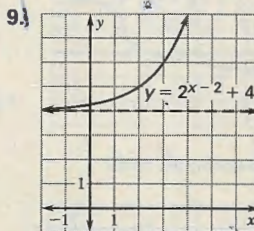
range:  $y > 0$



| x  | y               |
|----|-----------------|
| 0  | $\frac{10}{9}$  |
| 2  | 2               |
| -1 | $\frac{28}{27}$ |

domain: all real numbers

range:  $y > 1$



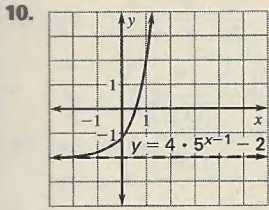
| x  | y              |
|----|----------------|
| 0  | $\frac{17}{4}$ |
| 2  | 5              |
| -1 | $\frac{33}{8}$ |

domain: all real numbers

range:  $y > 4$



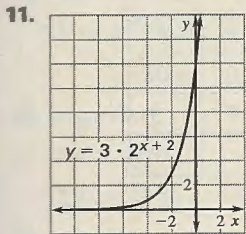
# Extra Practice *continued*



| x  | y                |
|----|------------------|
| 0  | $-\frac{6}{5}$   |
| 1  | 2                |
| -1 | $-\frac{46}{25}$ |

domain: all real numbers

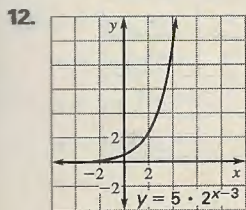
range:  $y > -2$



| x  | y             |
|----|---------------|
| 0  | 12            |
| -2 | 3             |
| -3 | $\frac{3}{2}$ |
| -4 | $\frac{3}{4}$ |

domain: all real numbers

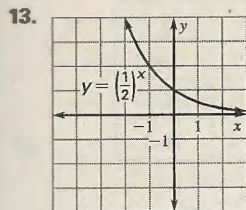
range:  $y > 0$



| x  | y              |
|----|----------------|
| 0  | $\frac{5}{8}$  |
| 3  | 5              |
| -1 | $\frac{5}{16}$ |
| 1  | $\frac{5}{4}$  |

domain: all real numbers

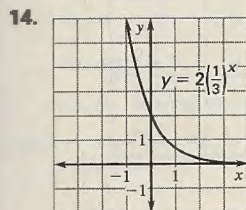
range:  $y > 0$



| x  | y             |
|----|---------------|
| 0  | 1             |
| 1  | $\frac{1}{2}$ |
| -1 | 2             |

domain: all real numbers

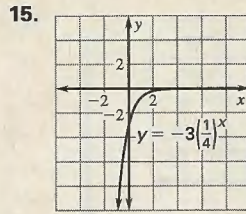
range:  $y > 0$



| x  | y             |
|----|---------------|
| 0  | 2             |
| 1  | $\frac{2}{3}$ |
| -1 | 6             |

domain: all real numbers

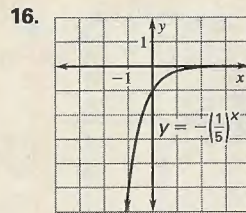
range:  $y > 0$



| x              | y              |
|----------------|----------------|
| 0              | -3             |
| 1              | $-\frac{3}{4}$ |
| $-\frac{1}{2}$ | -6             |

domain: all real numbers

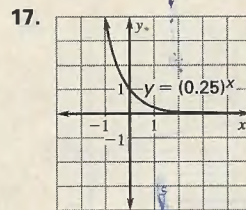
range:  $y < 0$



| x  | y              |
|----|----------------|
| 0  | -1             |
| 1  | $-\frac{1}{5}$ |
| -1 | -5             |

domain: all real numbers

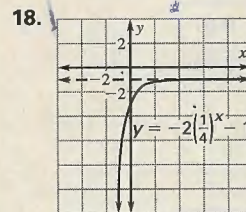
range:  $y < 0$



| x  | y             |
|----|---------------|
| 0  | 1             |
| 1  | $\frac{1}{4}$ |
| -1 | 4             |

domain: all real numbers

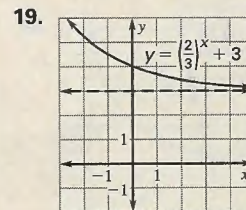
range:  $y > 0$



| x              | y    |
|----------------|------|
| 0              | -3   |
| 1              | -1.5 |
| $-\frac{1}{2}$ | -5   |

domain: all real numbers

range:  $y < -1$



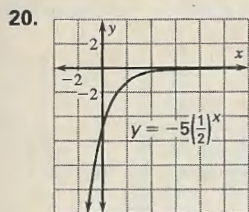
| x  | y              |
|----|----------------|
| 0  | 4              |
| 1  | $\frac{11}{3}$ |
| -1 | $\frac{9}{2}$  |

domain: all real numbers

range:  $y > 3$



# Extra Practice *continued*



| x  | y              |
|----|----------------|
| 0  | -5             |
| 1  | $-\frac{5}{2}$ |
| -1 | -10            |

domain: all real numbers

range:  $y < 0$

21.  $e^4 \cdot e^3 = e^{4+3} = e^7$     22.  $e^{-6} \cdot e^7 = e^{-6+7} = e$

23.  $4e^{3x} \cdot 4e^{3x} = 4 \cdot 4e^{3x+3x} = 16e^{6x}$

24.  $(7e^{-x})^{-2} = \frac{1}{(7e^{-x})^2} = \frac{1}{7^2 e^{-2x}} = \frac{e^{2x}}{49}$

25.  $\frac{10e^x}{e^{3x}} = 10e^{x-3x} = 10e^{-2x} = \frac{10}{e^{2x}}$

26.  $\sqrt[3]{64e^{6x}} = \sqrt[3]{4^3(e^{2x})^3} = 4e^{2x}$

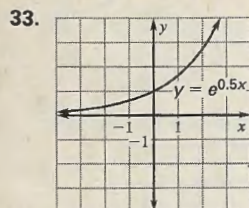
27.  $e^{2x} \cdot e^{4x-1} = e^{2x+4x-1} = e^{6x-1}$

28.  $\frac{e^x}{5e} = \frac{e^{x-1}}{5}$     29.  $\frac{20e^{4x}}{5e} = 4e^{4x-1}$

30.  $(6e^{-2x})^3 = 6^3 e^{-6x} = 216e^{-6x}$

31.  $\sqrt{16e^{8x}} = \sqrt{4^2(e^{4x})^2} = 4e^{4x}$

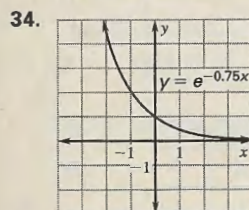
32.  $(\frac{1}{3}e^{-3})^{-3} = (\frac{1}{3})^{-3} e^9 = 27e^9$



| x  | y    |
|----|------|
| 0  | 1    |
| 1  | 1.65 |
| -1 | 0.61 |
| 2  | 2.72 |

domain: all real numbers

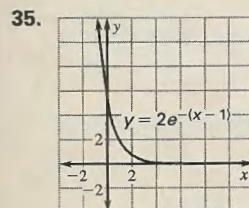
range:  $y > 0$



| x  | y    |
|----|------|
| 0  | 1    |
| 1  | 0.47 |
| -1 | 2.11 |

domain: all real numbers

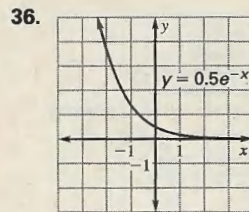
range:  $y > 0$



| x  | y     |
|----|-------|
| 0  | 5.44  |
| 1  | 2     |
| -1 | 14.78 |

domain: all real numbers

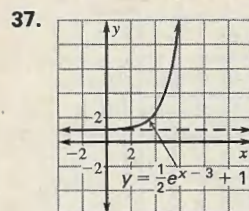
range:  $y > 0$



| x  | y    |
|----|------|
| 0  | 0.5  |
| 1  | 0.18 |
| -1 | 1.36 |

domain: all real numbers

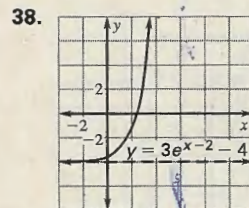
range:  $y > 0$



| x  | y    |
|----|------|
| 0  | 1.02 |
| 3  | 1.5  |
| -1 | 1.01 |

domain: all real numbers

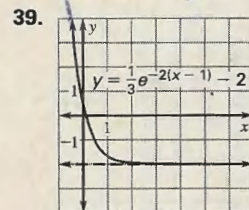
range:  $y > 1$



| x  | y     |
|----|-------|
| 0  | -3.6  |
| 2  | -1    |
| -1 | -3.85 |

domain: all real numbers

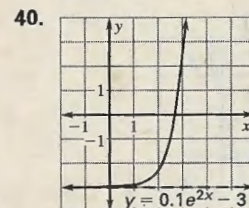
range:  $y > -4$



| x  | y     |
|----|-------|
| 0  | 0.46  |
| 1  | -1.67 |
| -1 | 16.2  |

domain: all real numbers

range:  $y > -2$



| x  | y     |
|----|-------|
| 0  | -2.9  |
| 1  | -2.3  |
| -1 | -2.99 |

domain: all real numbers

range:  $y > -3$

41.  $P = 14.7e^{-0.00004h}$   
 $P = 14.7e^{-0.00004(12,388)}$   
 $P = 14.7e^{0.49552}$

$P \approx 8.96$  pounds per square inch



## Extra Practice *continued*

42.  $\log_2 16$

$$2^x = 16$$

$$2^4 = 16 \text{ so } x = 4$$

44.  $\log_{11} 1$

$$11^x = 1$$

$$11^0 = 1 \text{ so } x = 0$$

46.  $\log_3 3^{-2.16}$

$$3^x = 3^{-2.16} \text{ so } x = -2.16$$

48.  $\log_{29} 29$

$$29^x = 29$$

$$29^1 = 29 \text{ so } x = 1$$

50.  $y = \log_4 x$

$$x = \log_4 y$$

$$4^x = y \text{ so } y = 4^x$$

52.  $y = \log_6 36^x$

$$y = \log_6 (6^2)^x$$

$$y = \log_6 (6)^{2x}$$

$$x = \log_6 (6)^{2y}$$

$$x = 2y$$

$$\frac{x}{2} = y \text{ so } y = \frac{1}{2}x$$

54.  $y = \ln(x + 1)$

$$x = \ln(y + 1)$$

$$e^x = y + 1$$

$$y = e^x - 1$$

43.  $\log_5 25$

$$5^x = 25$$

$$5^2 = 25 \text{ so } x = 2$$

45.  $\log_{1/4} 2$

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

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

$$\text{so } x = -\frac{1}{2}$$

47.  $\log_7 343$

$$7^x = 343$$

$$7^3 = 343 \text{ so } x = 3$$

49.  $\log_9 9^3$

$$9^x = 9^3 \text{ so } x = 3$$

51.  $y = \log_{1/3} x$

$$x = \log_{1/3} y$$

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

53.  $y = \ln 3x$

$$x = \ln 3y$$

$$e^x = 3y$$

$$\frac{e^x}{3} = y \text{ so } y = \frac{1}{3}e^x$$

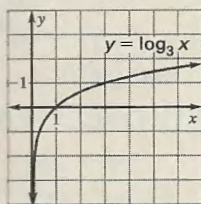
55.  $y = \ln(x - 3)$

$$x = \ln(y - 3)$$

$$e^x = y - 3$$

$$y = e^x + 3$$

56.

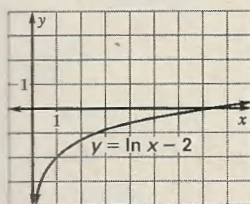


| x             | y  |
|---------------|----|
| 1             | 0  |
| $\frac{1}{3}$ | -1 |
| 9             | 2  |

domain:  $x > 0$

range: all real numbers

57.

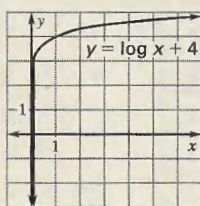


| x   | y    |
|-----|------|
| 1   | -2   |
| 0.5 | -2.7 |
| 2   | -1.3 |

domain:  $x > 0$

range: all real numbers

58.

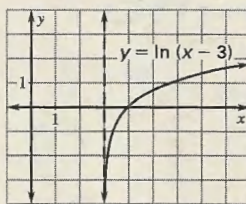


| x              | y |
|----------------|---|
| 1              | 4 |
| 10             | 5 |
| $\frac{1}{10}$ | 3 |

domain:  $x > 0$

range: all real numbers

59.

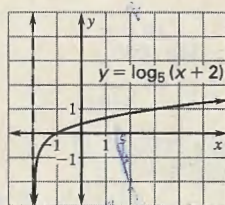


| x   | y    |
|-----|------|
| 4   | 0    |
| 3.5 | -0.7 |
| 5   | 0.7  |

domain:  $x > 3$

range: all real numbers

60.

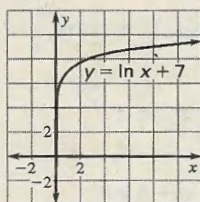


| x              | y  |
|----------------|----|
| -1             | 0  |
| 3              | 1  |
| $-\frac{9}{5}$ | -1 |

domain:  $x > -2$

range: all real numbers

61.

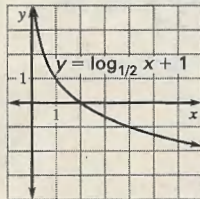


| x   | y    |
|-----|------|
| 1   | 7    |
| 2   | 7.69 |
| 0.5 | 6.31 |

domain:  $x > 0$

range: all real numbers

62.



| x             | y  |
|---------------|----|
| 1             | 1  |
| $\frac{1}{2}$ | 2  |
| 2             | 0  |
| 4             | -1 |

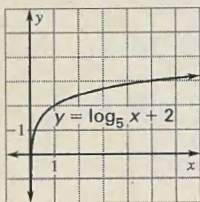
domain:  $x > 0$

range: all real numbers



## Extra Practice *continued*

63.



| x             | y |
|---------------|---|
| 1             | 2 |
| $\frac{1}{5}$ | 1 |
| 5             | 3 |

domain:  $x > 0$

range: all real numbers

64.  $\log_2(4 \cdot 8) = \log_2 4 + \log_2 8 = 2 + 3 = 5$

65.  $\ln e^3 = 3 \ln e = 3(1) = 3$

66.  $\log_2 8^2 = \log_2 64 = \frac{\log 64}{\log 2} = 6$

67.  $\log_6 216 = \frac{\log 216}{\log 6} = 3$

68.  $\log \frac{1}{100} = \log 1 - \log 100 = 0 - 2 = -2$

69.  $\ln \frac{1}{e^5} = \ln 1 - \ln e^5 = 0 - 5 = -5$

70.  $\log 0.001 = \log \frac{1}{1000} = \log 1 - \log 1000$   
 $= 0 - 3 = -3$

71.  $\log_3 27^2 = 2 \log_3 27 = 2 \left( \frac{\log 27}{\log 3} \right) = 2(3) = 6$

72.  $\log_3 9x = \log_3 9 + \log_3 x = 2 + \log_3 x$

73.  $\log 3x^4 = \log 3 + \log x^4 = \log 3 + 4 \log x$

74.  $\log_6 x^5 = 5 \log_6 x$     75.  $\ln 15x = \ln 15 + \ln x$

76.  $\log_7 49x^2 = \log_7 49 + \log x^2 = \log_7 7^2 + 2 \log_7 x$   
 $= 2 + 2 \log_7 x$

77.  $\log \sqrt{9x} = \log (9x)^{1/2} = \log 9^{1/2} + \log x^{1/2}$   
 $= \log 3 + \frac{1}{2} \log x$

78.  $\ln x^{1/3} y^4 = \ln x^{1/3} + \ln y^4 = \frac{1}{3} \ln x + 4 \ln y$

79.  $\log x^2 y^3 z^4 = \log x^2 + \log y^3 + \log z^4$   
 $= 2 \log x + 3 \log y + 4 \log z$

80.  $\log_4 7 + \log_4 10 - \log_4 2 = \frac{\log_4 70}{\log_4 2} = \log_4 35$

81.  $4 \ln x + 6 \ln y + 3 \ln z = \ln x^4 + \ln y^6 + \ln z^3$   
 $= \ln x^4 y^6 z^3$

82.  $5 \log_4 3 + 6 \log_4 x + 7 \log_4 y$   
 $= \log_4 3^5 + \log_4 x^6 + \log_4 y^7$   
 $= \log_4 243 + \log_4 x^6 + \log_4 y^7$   
 $= \log_4 243x^6y^7$

83.  $\frac{1}{4}(\ln 9 - \ln x) + \frac{1}{4} \ln 3 = \frac{1}{4} \left( \frac{\ln 9}{\ln x} \right) + \ln 3^{1/4}$   
 $= \ln \frac{(9)^{1/4}(3)^{1/4}}{x^{1/4}} = \ln \left( \frac{27}{x} \right)^{1/4}$

84.  $6(\ln 3 + \ln x) + \frac{1}{4} \ln 3 = \ln(3x)^6 + \ln(3)^{1/4}$   
 $= \ln(3)^{24/4} + \ln(3)^{1/4} + \ln x^6$   
 $= \ln(3)^{25/4} + \ln x^6$   
 $= \ln(3)^{25/4} x^6$

85.  $3(\log_5 10 - \log_5 2) + \frac{1}{2} \log_5 \frac{1}{100}$   
 $= \log_5 \left( \frac{10}{2} \right)^3 + \log_5 \left( \frac{1}{100} \right)^{1/2}$   
 $= \log_5 5^3 + \log_5 \frac{1}{10}$   
 $= \log_5 5^3 10^{-1}$   
 $= \log_5 \left( \frac{25}{2} \right)$

86.  $3^x = 10$   
 $\log_3 3^x = \log_3 10$   
 $x = \log_3 10$   
 $x = \frac{\log 10}{\log 3} \approx 2.10$

87.  $4^x - 3 = 11$   
 $4^x = 14$   
 $\log_4 4^x = \log_4 14$   
 $x = \log_4 14$   
 $x = \frac{\log 14}{\log 4} \approx 1.90$

88.  $3^{x+2} = 9^{x+1}$   
 $\log_3 3^{x+2} = \log_3 (3^2)^{x+1}$   
 $\log_3 3^{x+2} = \log_3 3^{2x+2}$   
 $x + 2 = 2x + 2$   
 $0 = x$

89.  $10^x + 4 = 10$   
 $10^x = 6$   
 $\log 10^x = \log 6$   
 $x = \log 6 \approx 0.778$

90.  $\ln 8x = 4$   
 $\ln 8 + \ln x = 4$   
 $\ln x = 4 - \ln 8$   
 $\ln x \approx 1.921$   
 $e^{1.921} = x$   
 $x \approx 6.825$

91.  $\ln(5 - x) = 12$   
 $e^{12} = 5 - x$   
 $e^{12} - 5 = -x$   
 $x = 5 - e^{12}$   
 $x \approx -162,749 \approx -163,000$



## Extra Practice *continued*

92.  $\log_3 x = 4$

$$3^4 = x$$

$$81 = x$$

94.  $(2, 18), (1, 6)$

$$18 = ab^2$$

$$6 = ab^1$$

$$y = ab^x$$

$$a = \frac{18}{b^2} \quad \frac{6}{18} = b^{-1}$$

$$6 = \frac{18}{b^2}(b^1) \quad \frac{1}{3} = b^{-1}$$

$$6 = 18b^{-1} \quad 3 = b$$

$$a = \frac{18}{(3)^2} = \frac{18}{9} = 2$$

$$y = 2(3)^x$$

95.  $(0, 0.5), (3, 4)$

$$0.5 = ab^0 \quad a = \frac{0.5}{b^0} = 0.5$$

$$4 = ab^3 \quad 4 = 0.5b^3$$

$$y = ab^x$$

$$a = 0.5 \quad \frac{4}{0.5} = b^3$$

$$y = 0.5(2)^x \quad 8 = b^3$$

$$2 = b$$

96.  $(-1, 6), (1, 0.5)$

$$6 = ab^{-1} \quad a = \frac{6}{b^{-1}} = 6b^1$$

$$0.5 = ab^1 \quad 0.5 = 6b^1(b^1)$$

$$y = ab^x \quad 0.5 = 6b^2$$

$$a = 6(0.289) \quad \frac{0.5}{6} = b^2$$

$$a = 1.73 \quad \frac{0.5}{6} = b^2$$

$$y = 1.73(0.289)^x \quad b = 0.289$$

97.  $(-2, 0.01), (1, 1.25)$

$$0.01 = ab^{-2}$$

$$1.25 = ab^1$$

$$a = \frac{0.01}{b^{-2}} = 0.01b^2$$

$$1.25 = 0.01b^2(b^1)$$

$$\frac{1.25}{0.01} = b^3$$

$$5 = b$$

$$y = ab^x$$

$$a = 0.01(5)^2$$

$$a = 0.01(25)$$

$$a = 0.25$$

$$y = 0.25(5)^x$$

93.  $\log_5(2x + 10) = \log_5 4x$

$$2x + 10 = 4x$$

$$10 = 2x$$

$$x = 5$$

98.  $(3, 9), \left(8, \frac{25}{4}\right)$

$$9 = ab^3$$

$$\frac{25}{4} = ab^8$$

$$y = ab^x$$

$$a = \frac{9}{b^3}$$

$$\frac{25}{4} = \frac{9}{b^3}(b^8)$$

$$\frac{25}{4} = 9b^5$$

$$\frac{25}{4}\left(\frac{1}{9}\right) = b^5$$

$$\frac{25}{36} = b^5$$

$$\frac{1.9}{2.05} \approx b$$

$$b \approx 0.93$$

$$a = \frac{9}{(0.93)^3} \approx 11.2$$

$$y = 11.2(0.93)^x$$

99.  $\left(-1, \frac{1}{4}\right), \left(2, \frac{3}{8}\right)$

$$\frac{1}{4} = ab^{-1}$$

$$\frac{3}{8} = ab^2$$

$$y = ab^x$$

$$a = \frac{1}{b^{-1}} = \frac{1}{4}b^1$$

$$\frac{3}{8} = \frac{1}{4}b^1(b^2)$$

$$\frac{3}{8} = \frac{1}{4}b^3$$

$$\frac{3}{8} \cdot \frac{4}{1} = b^3$$

$$\frac{3}{2} = b^3$$

$$\frac{1.44}{1.26} \approx b$$

$$1.14 = b$$

$$a = \frac{1}{4}(1.14) \approx 0.286$$

$$y = 0.286(1.14)^x$$



# Extra Practice *continued*

## Chapter 9 (pp. 944–945)

1.  $y = \frac{18}{x}$       2.  $y = \frac{16}{x}$       3.  $y = -\frac{4}{x}$

$y = \frac{18}{4} = 4.5$        $y = \frac{16}{4} = 4$        $y = -\frac{4}{4} = -1$

4.  $y = \frac{12}{x}$       5.  $y = -\frac{3}{x}$       6.  $y = \frac{3}{x}$

$y = \frac{12}{4} = 3$        $y = -\frac{3}{4}$        $y = \frac{3}{4}$

7.  $y = \frac{1}{16x}$       8.  $y = \frac{1}{25x}$       9.  $z = xy$

$y = \frac{1}{16 \cdot 4}$        $y = \frac{1}{25 \cdot 4}$        $z = 4 \cdot 7$

$= \frac{1}{64}$        $= \frac{1}{100}$        $= 28$

10.  $z = -xy$       11.  $z = \frac{-xy}{30}$       12.  $z = -2xy$

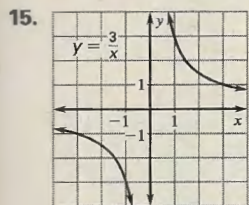
$z = -(4)(7)$        $z = \frac{-28}{30}$        $z = -2 \cdot 4 \cdot 7$

$= -28$        $= -\frac{14}{15}$        $= -56$

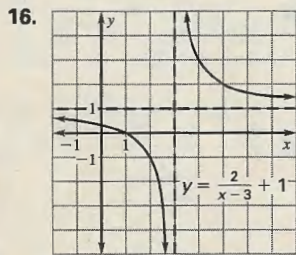
13.  $z = \frac{64xy}{3}$       14.  $z = \frac{20xy}{7}$

$z = \frac{64 \cdot 4 \cdot 7}{3}$        $z = \frac{20 \cdot 4 \cdot 7}{7}$

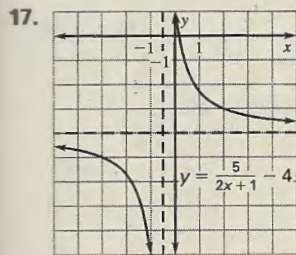
$= \frac{1792}{3}$        $= 80$



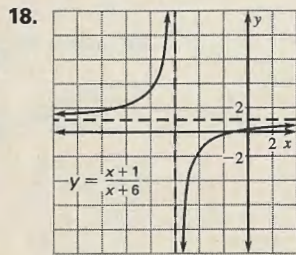
all reals except 0;  
all reals except 0



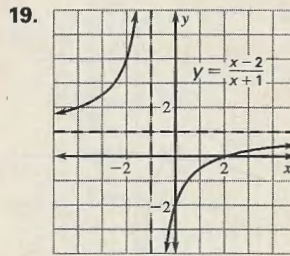
all reals except 3;  
all reals except 1



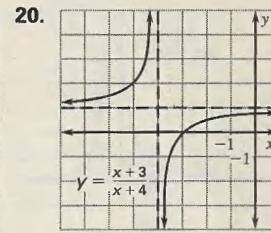
all reals except  $-\frac{1}{2}$ ;  
all reals except -4



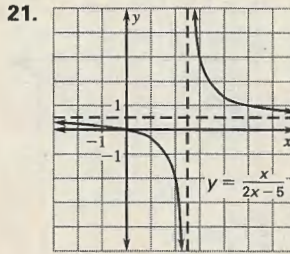
all reals except -6;  
all reals except 1



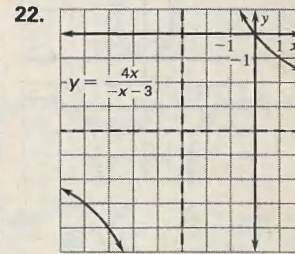
all reals except -1;  
all reals except 1



all reals except -4;  
all reals except 1



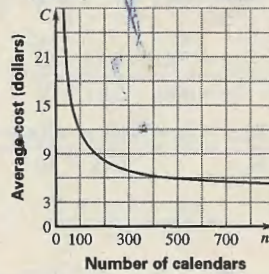
all reals except  $\frac{5}{2}$ ;  
all reals except  $\frac{1}{2}$



all reals except -3;  
all reals except -4

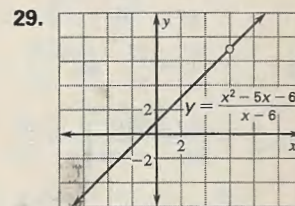
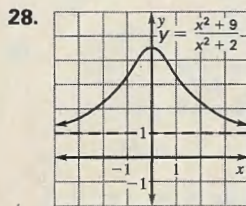
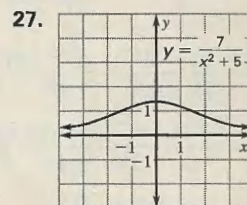
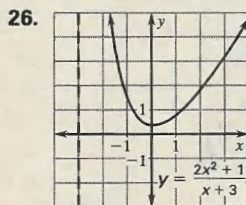
23.  $C = \frac{4.5n + 710}{n}$

### 24. Average Cost of Calendars



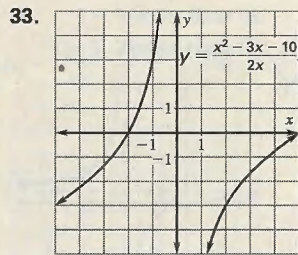
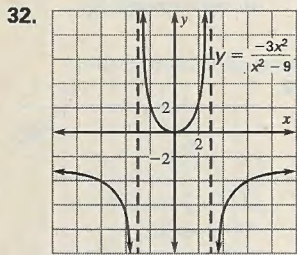
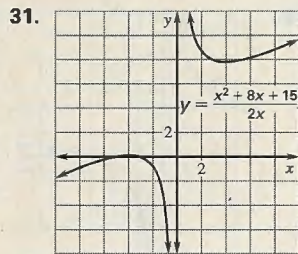
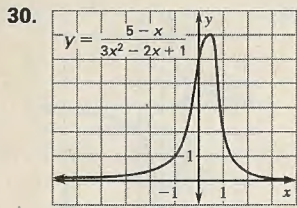
about 475 calendars

25. The average cost decreases about 475 calendars as the number of calendars printed increases.





## Extra Practice *continued*



34.  $\frac{3xy^5}{x^2y^3} \cdot \frac{y^2}{6x} = \frac{y^4}{2x^2}$     35.  $\frac{20x^5}{y^2} \cdot \frac{x^2y^2}{10x^3} = 2x^4$

36.  $\frac{x^2-4}{x-3} \cdot \frac{x+2}{8x-16} = \frac{(x+2)(x-2)(x+2)}{(x-3) \cdot 8(x-2)} = \frac{(x+2)^2}{8(x-3)}$

37.  $\frac{x^3+3x^2}{2x} \cdot \frac{5x^3}{x^2+5x+6} = \frac{x^2(x+3) \cdot 5x^3}{2x(x+2)(x+3)} = \frac{5x^4}{2(x+2)}$

38.  $\frac{7x^2-14x}{x^3} \div \frac{5x-10}{x^5} = \frac{7x(x-2)}{x^3} \cdot \frac{x^5}{5(x-2)} = \frac{7x^3}{5}$

39.  $\frac{x^2-x-20}{x+4} \cdot \frac{x-3}{x^2-2x-15} = \frac{(x-5)(x+4)(x-3)}{(x+4)(x-5)(x+3)} = \frac{x-3}{x+3}$

40.  $(x^2+5x-36) \div \frac{5x^2+45x}{x-6} = \frac{(x+9)(x-4)(x-6)}{5x(x+9)} = \frac{(x-4)(x-6)}{5x}$

41.  $x^3+8 \cdot \frac{6x^3-9x^2}{3x^3-12x} = \frac{(x+2)(x^2-2x+4)(3x^2)(2x-3)}{3x(x-2)(x+2)} = \frac{x(x^2-2x+4)(2x-3)}{x-2}$

42.  $\frac{x^2+2x-35}{x^2-7x+12} \div \frac{x^2-13x+40}{3x^2-12x} = \frac{(x+7)(x-5)(3x)(x-4)}{(x-3)(x-4)(x-5)(x-8)} = \frac{3x(x+7)}{(x-3)(x-8)}$

43.  $\frac{3}{5x} + \frac{9}{5x} = \frac{12}{5x}$     44.  $\frac{15}{6x^2} - \frac{8}{6x^2} = \frac{7}{6x^2}$

45.  $\frac{4}{3x} + \frac{2}{5x} = \frac{20+6}{15x} = \frac{26}{15x}$

46.  $\frac{3}{2(x-1)} + \frac{x+1}{4} = \frac{6+(x-1)(x+1)}{4(x-1)} = \frac{x^2+5}{4(x-1)}$

47.  $\frac{2x+1}{x^2-4} + \frac{5}{x-2} = \frac{2x+1+5(x+2)}{(x-2)(x+2)} = \frac{7x+11}{(x-2)(x+2)}$

48.  $\frac{4-9x}{x+5} + \frac{1}{2x-1} = \frac{(4-9x)(2x-1)+(x+5)}{(x+5)(2x-1)} = \frac{-18x^2+17x-4+x+5}{(x+5)(2x-1)} = \frac{-18x^2+18x+1}{(x+5)(2x-1)}$

49.  $\frac{7}{x^2+8x+15} - \frac{3}{x+5} = \frac{7-3(x+3)}{(x+3)(x+5)} = \frac{-3x-2}{(x+3)(x+5)}$

50.  $\frac{8x-1}{x^2+x-6} - \frac{4}{x-2} = \frac{8x-1-4(x+3)}{(x-2)(x+3)} = \frac{4x-13}{(x-2)(x+3)}$

51.  $\frac{\frac{4}{x}-4}{2+\frac{1}{x}} = \left(\frac{4-4x}{x}\right) \div \left(\frac{2x+1}{x}\right) = \frac{-4(x-1)}{x} \cdot \frac{x}{2x+1} = \frac{-4(x-1)}{2x+1}$

52.  $\frac{\frac{9}{x+1}}{\frac{1}{3}-\frac{6}{x+1}} = \frac{9}{x+1} \cdot \frac{3(x+1)}{x-17} = \frac{27}{x-17}$

53.  $\frac{\frac{7}{5x+2} - \frac{3}{2(5x+2)}}{\frac{x^2}{5x+2}} = \frac{11}{2(5x+2)} \cdot \frac{5x+2}{x^2} = \frac{11}{2x^2}$

54.  $\frac{\frac{2}{3x^2-3}}{\frac{1}{x+1} + \frac{3x}{x^2-2x-3}} = \frac{2}{3(x+1)(x-1)} \div \left[\frac{x-3+3x}{(x+1)(x-3)}\right] = \frac{2}{3(x+1)(x-1)} \cdot \frac{(x+1)(x-3)}{4x-3} = \frac{2(x-3)}{3(x-1)(4x-3)}$



## Extra Practice *continued*

$$55. \frac{\frac{2}{3x-1} - \frac{5}{4(3x+1)}}{\frac{x}{9x^2-1}}$$

$$= \left[ \frac{8(3x+1) - 5(3x-1)}{4(3x+1)(3x-1)} \right] \cdot \frac{(3x-1)(3x+1)}{x}$$

$$= \frac{9x+13}{4x}$$

$$56. \frac{\frac{2}{x^2-4} + \frac{1}{x-2}}{\frac{5}{x-2} + \frac{3}{x+2}} = \frac{2+x+2}{(x-2)(x+2)} \div \frac{5(x+2)+3(x-2)}{(x-2)(x+2)}$$

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

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

$$57. \frac{\frac{8}{x^2-49}}{\frac{5}{3x^2-21x} - \frac{6}{x-7}} = \frac{8}{(x+7)(x-7)} \div \left[ \frac{5-6(3x)}{(3x)(x-7)} \right]$$

$$= \frac{8}{(x+7)(x-7)} \cdot \frac{3x(x-7)}{5-18x}$$

$$= \frac{24x}{(x+7)(5-18x)}$$

$$58. \frac{\frac{2}{3x^2+6x+12} + \frac{x}{x^3-8}}{\frac{3x}{2x^2+4} - \frac{x-2}{4x^2+8}}$$

$$= \left[ \frac{2}{3(x^2+2x+4)} + \frac{x}{(x-2)(x^2+2x+4)} \right] \cdot \left[ \frac{4(x^2+2)}{5x+2} \right]$$

$$= \left[ \frac{2x-4+3x}{3(x-2)(x^2+2x+4)} \right] \cdot \left[ \frac{4(x^2+2)}{5x+2} \right]$$

$$= \frac{4(5x-4)(x^2+2)}{3(x^3-8)(5x+2)}$$

$$59. \frac{7}{x} + \frac{1}{2} = 4$$

$$\frac{14+x}{2x} = 4$$

$$8x = 14 + x$$

$$7x = 14$$

$$x = 2$$

Check:

$$\frac{7}{2} + \frac{1}{2} \stackrel{?}{=} 4$$

$$\frac{8}{2} \stackrel{?}{=} 4$$

$$4 = 4$$

$$60. \frac{x}{4} + \frac{1}{2} = 5$$

$$\frac{x+2}{4} = 5$$

$$x+2 = 20$$

$$x = 18$$

Check:

$$\frac{18}{4} + \frac{1}{2} \stackrel{?}{=} 5$$

$$\frac{18}{4} + \frac{2}{4} \stackrel{?}{=} 5$$

$$\frac{20}{4} \stackrel{?}{=} 5$$

$$5 = 5$$

$$61. \frac{4}{x} + \frac{1}{3} = 10$$

$$\frac{12+x}{3x} = 10$$

$$30x = 12 + x$$

$$29x = 12$$

$$x = \frac{12}{29}$$

Check:

$$\frac{4}{\frac{12}{29}} + \frac{1}{3} \stackrel{?}{=} 10$$

$$\frac{29}{3} + \frac{1}{3} \stackrel{?}{=} 10$$

$$\frac{30}{3} \stackrel{?}{=} 10$$

$$10 = 10$$

$$62. \frac{1}{2x} + \frac{x}{3} = 7$$

$$3 + 2x^2 = 42x$$

$$2x^2 - 42x + 3 = 0$$

$$x = \frac{-(-42) \pm \sqrt{1764 - 24}}{4}$$

$$x \approx \frac{42 \pm 41.71}{4}$$

$$x = 0.0725$$

$$x = 20.9$$

Check: ( $x = 0.0725$ ):

$$\frac{1}{2(0.0725)} + \frac{(0.0725)}{3} \stackrel{?}{\approx} 7$$

$$\frac{1}{0.145} + \frac{0.0725}{3} \stackrel{?}{\approx} 7$$

$$6.9 \approx 7$$

Check: ( $x = 20.9$ ):

$$\frac{1}{2(20.9)} + \frac{20.9}{3} \stackrel{?}{\approx} 7$$

$$\frac{1}{41.8} + \frac{20.9}{3} \stackrel{?}{\approx} 7$$

$$6.99 \approx 7$$

$$63. \frac{-2}{x+3} = \frac{1}{x+1}$$

$$-2x - 2 = x + 3$$

$$-3x = 5$$

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

Check:

$$\frac{-2}{-\frac{5}{3}+3} \stackrel{?}{=} \frac{1}{-\frac{5}{3}+1}$$

$$\frac{-2}{\frac{4}{3}} = \frac{1}{-\frac{2}{3}}$$

$$-\frac{3}{2} = -\frac{3}{2}$$

$$64. \frac{4}{x+2} = \frac{-3}{x-3}$$

$$4x - 12 = -3x - 6$$

$$7x = 6$$

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

Check:

$$\frac{4}{\frac{6}{7}+2} \stackrel{?}{=} \frac{-3}{\frac{6}{7}-3}$$

$$\frac{4}{\frac{20}{7}} \stackrel{?}{=} \frac{-3}{-\frac{15}{7}}$$

$$\frac{7}{5} = \frac{7}{5}$$

$$65. \frac{-4}{x+1} = \frac{2}{x-1}$$

$$-4x + 4 = 2x + 2$$

$$-6x = -2$$

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

Check:

$$\frac{-4}{\frac{1}{3}+1} \stackrel{?}{=} \frac{2}{\frac{1}{3}-1}$$

$$\frac{-4}{\frac{4}{3}} \stackrel{?}{=} \frac{2}{-\frac{2}{3}}$$

$$-3 = -3$$



## Extra Practice *continued*

66.  $\frac{3}{x+4} = \frac{9}{x-2}$   
 $3x - 6 = 9x + 36$   
 $-6x = 42$   
 $x = -7$

Check:  
 $\frac{3}{-7+4} \stackrel{?}{=} \frac{9}{-7-2}$   
 $\frac{3}{-3} \stackrel{?}{=} \frac{9}{-9}$   
 $-1 = -1$

67.  $\frac{4x}{x-1} = \frac{x}{x^2-1}$   
 $4x(x+1)(x-1) = x(x-1)$   
 $4x(x+1) = x$   
 $4x^2 + 3x = 0$   
 $x(4x+3) = 0$   
 $x = 0$   
 $x = -\frac{3}{4}$

Check: ( $x = 0$ )  
 $\frac{4(0)}{0-1} \stackrel{?}{=} \frac{0}{0^2-1}$   
 $0 = 0$   
 Check: ( $x = -\frac{3}{4}$ ):  
 $4\left(-\frac{3}{4}\right) \stackrel{?}{=} \frac{-3}{\left(-\frac{3}{4}\right)^2 - 1}$   
 $-\frac{3}{4} - 1 \stackrel{?}{=} \frac{-3}{\frac{9}{16} - 1}$   
 $-\frac{7}{4} \stackrel{?}{=} \frac{-3}{-\frac{7}{16}}$   
 $\frac{12}{7} = \frac{12}{7}$

68.  $\frac{5x}{10-x} = \frac{x^2}{x-10}$   
 $5x^2 - 50x = 10x^2 - x^3$   
 $x^3 - 5x^2 - 50x = 0$   
 $x(x^2 - 5x - 50) = 0$   
 $x(x+5)(x-10) = 0$   
 $x = 0$   
 $x + 5 = 0$   
 $x = -5$

Check: ( $x = 0$ ):  
 $\frac{5(0)}{10-0} \stackrel{?}{=} \frac{0^2}{0-10}$   
 $0 = 0$   
 Check: ( $x = -5$ ):  
 $\frac{5(-5)}{10-(-5)} \stackrel{?}{=} \frac{(-5)^2}{-5-10}$   
 $\frac{-25}{15} \stackrel{?}{=} \frac{25}{-15}$   
 $-\frac{5}{3} = -\frac{5}{3}$

69.  $\frac{3}{x^2-9} = \frac{6}{x+3}$   
 $3(x+3) = 6(x+3)(x-3)$   
 $3 = 6(x-3)$   
 $3 = 6x - 18$   
 $21 = 6x$   
 $x = \frac{21}{6}$   
 $x = \frac{7}{2}$

Check:  
 $\frac{3}{\left(\frac{7}{2}\right)^2 - 9} \stackrel{?}{=} \frac{6}{\frac{7}{2} + 3}$   
 $\frac{3}{\frac{49}{4} - 9} \stackrel{?}{=} \frac{6}{\frac{13}{2}}$   
 $\frac{12}{13} = \frac{12}{13}$

70.  $\frac{3}{x^2-4} = \frac{2}{x+2} + \frac{x}{x-2}$   
 $3 = 2(x-2) + x(x+2)$   
 $3 = 2x - 4 + x^2 + 2x$   
 $x^2 + 4x - 7 = 0$   
 $x = \frac{-4 \pm \sqrt{16+28}}{2}$   
 $x = \frac{-4 \pm \sqrt{44}}{2} = -2 \pm \sqrt{11}$   
 $x \approx 1.32$   
 $x \approx -5.32$

Check: ( $x = 0$ ):  
 $\frac{3}{(1.32)^2 - 4} \stackrel{?}{=} \frac{2}{1.32 + 2} + \frac{1.32}{1.32 - 2}$   
 $\frac{3}{-2.258} \stackrel{?}{=} 0.602 + (-1.941)$   
 $-1.33 \approx -1.34$   
 Check: ( $x = -5.32$ ):  
 $\frac{3}{(-5.32)^2 - 4} \stackrel{?}{=} \frac{2}{-5.32 + 2} + \frac{-5.32}{-5.32 - 2}$   
 $\frac{3}{24.302} \stackrel{?}{=} -0.602 + 0.727$   
 $0.123 \approx 0.125$

### Chapter 10 (pp. 953-955)

1. (0, 0), (6, 8)

$$d = \sqrt{(0-6)^2 + (0-8)^2} = \sqrt{36 + 64} = \sqrt{100} = 10$$

$$\left(\frac{0+6}{2}, \frac{0+8}{2}\right) = \left(\frac{6}{2}, \frac{8}{2}\right) = (3, 4)$$

2. (0, 5), (-2, 0)

$$d = \sqrt{(0+2)^2 + (5-0)^2} = \sqrt{4 + 25} = \sqrt{29} \approx 5.39$$

$$\left(\frac{0-2}{2}, \frac{5+0}{2}\right) = \left(\frac{-2}{2}, \frac{5}{2}\right) = \left(-1, \frac{5}{2}\right)$$

3. (-4, -2), (1, -5)

$$d = \sqrt{(-4-1)^2 + (-2+5)^2} = \sqrt{25 + 9} = \sqrt{34} \approx 5.83$$

$$\left(\frac{-4+1}{2}, \frac{-2-5}{2}\right) = \left(\frac{-3}{2}, \frac{-7}{2}\right)$$

4. (3, 3), (3, 6)

$$d = \sqrt{(3-3)^2 + (3-6)^2} = \sqrt{0 + 9} = \sqrt{9} = 3$$

$$\left(\frac{3+3}{2}, \frac{3+6}{2}\right) = \left(\frac{6}{2}, \frac{9}{2}\right) = \left(3, \frac{9}{2}\right)$$



## Extra Practice continued

54.  $P(A') = 1 - P(A)$

$$P(A') = 1 - \frac{1}{2} = \frac{1}{2}$$

56.  $P(A') = 1 - P(A)$

$$P(A') = 1 - 1 = 0$$

58.  $P(A') = 1 - P(A)$

$$P(A') = 1 - 0.6 = 0.4$$

60.  $P(A') = 1 - P(A)$

$$P(A') = 1 - \frac{1}{12} = \frac{11}{12}$$

62. blue, then blue

$$P(A \text{ and } B) = \frac{5}{15} \cdot \frac{5}{15}$$

$$= \frac{25}{225} = \frac{1}{9}$$

64. blue, then green

$$P(A \text{ and } B) = \frac{5}{15} \cdot \frac{6}{15}$$

$$= \frac{30}{225} = \frac{2}{15}$$

66. green, then green

$$P(A \text{ and } B) = \frac{6}{15} \cdot \frac{6}{15}$$

$$= \frac{36}{225} = \frac{4}{25}$$

68. blue, then yellow

$$P(A \text{ and } B) = \frac{5}{15} \cdot \frac{4}{15}$$

$$= \frac{20}{225} = \frac{4}{45}$$

70. exactly 3 sixes

$$P(k = 3) = {}_{10}C_3 \left(\frac{1}{6}\right)^3 \left(1 - \frac{1}{6}\right)^{10-3}$$

$$P(k = 3) = 120 \left(\frac{1}{6}\right)^3 \left(\frac{5}{6}\right)^7$$

$$P(k = 3) = 0.155$$

71. exactly 4 ones

$$P(k = 4) = {}_{10}C_4 \left(\frac{1}{6}\right)^4 \left(1 - \frac{1}{6}\right)^{10-4}$$

$$P(k = 4) = 210 \left(\frac{1}{6}\right)^4 \left(\frac{5}{6}\right)^6$$

$$P(k = 4) = 0.0543$$

72. all odd numbers

$$P(k = 10) = {}_{10}C_{10} \left(\frac{3}{6}\right)^{10} \left(1 - \frac{3}{6}\right)^{10-10}$$

$$P(k = 10) = 1 \left(\frac{3}{6}\right)^{10} \left(\frac{3}{6}\right)^0$$

$$P(k = 10) = 0.000977$$

73. exactly 3 evens

$$P(k = 3) = {}_{10}C_3 \left(\frac{3}{6}\right)^3 \left(1 - \frac{3}{6}\right)^{10-3}$$

$$P(k = 3) = 120 \left(\frac{3}{6}\right)^3 \left(\frac{3}{6}\right)^7$$

$$P(k = 3) = 0.117$$

74. no odd numbers

$$P(k = 0) = {}_{10}C_0 \left(\frac{3}{6}\right)^0 \left(1 - \frac{3}{6}\right)^{10-0}$$

$$P(k = 0) = 1 \left(\frac{3}{6}\right)^0 \left(\frac{3}{6}\right)^{10}$$

$$P(k = 0) = 0.000977$$

55.  $P(A') = 1 - P(A)$

$$P(A') = 1 - 0 = 1$$

57.  $P(A') = 1 - P(A)$

$$P(A') = 1 - \frac{3}{4} = \frac{1}{4}$$

59.  $P(A') = 1 - P(A)$

$$P(A') = 1 - 0.2 = 0.8$$

61.  $P(A') = 1 - P(A)$

$$P(A') = 1 - \frac{15}{16} = \frac{1}{16}$$

63. green, then yellow

$$P(A \text{ and } B) = \frac{6}{15} \cdot \frac{4}{15}$$

$$= \frac{24}{225} = \frac{8}{75}$$

65. yellow, then blue

$$P(A \text{ and } B) = \frac{4}{15} \cdot \frac{5}{15}$$

$$= \frac{20}{225} = \frac{4}{45}$$

67. yellow, then green

$$P(A \text{ and } B) = \frac{4}{15} \cdot \frac{6}{15}$$

$$= \frac{24}{225} = \frac{8}{75}$$

69. green, then blue

$$P(A \text{ and } B) = \frac{6}{15} \cdot \frac{5}{15}$$

$$= \frac{30}{225} = \frac{2}{15}$$

75. exactly 6 threes

$$P(k = 6) = {}_{10}C_6 \left(\frac{1}{6}\right)^6 \left(1 - \frac{1}{6}\right)^{10-6}$$

$$P(k = 6) = 210 \left(\frac{1}{6}\right)^6 \left(\frac{5}{6}\right)^4$$

$$P(k = 6) = 0.00217$$

76. exactly 7 fives

$$P(k = 7) = {}_{10}C_7 \left(\frac{1}{6}\right)^7 \left(1 - \frac{1}{6}\right)^{10-7}$$

$$P(k = 7) = 120 \left(\frac{1}{6}\right)^7 \left(\frac{5}{6}\right)^3$$

$$P(k = 7) = 0.000248$$

77. 8 rolls greater than four

$$P(k = 8) = {}_{10}C_8 \left(\frac{2}{6}\right)^8 \left(1 - \frac{2}{6}\right)^{10-8}$$

$$P(k = 8) = 45 \left(\frac{2}{6}\right)^8 \left(\frac{4}{6}\right)^2$$

$$P(k = 8) = 0.00305$$

78. between 31 and 41

$$0.34 + 0.34 = 0.68$$

79. between 21 and 36

$$0.0235 + 0.135 + 0.34 = 0.4985$$

80. between 31 and 46

$$0.34 + 0.34 + 0.135 = 0.815$$

81. less than 41

$$0.34 + 0.34 + 0.135 + 0.0235 + 0.0015 = 0.84$$

82. greater than 26

$$0.135 + 0.34 + 0.34 + 0.135 +$$

$$0.0235 + 0.0015 = 0.975$$

83. less than 51

$$0.0235 + 0.135 + 0.34 + 0.34 + 0.135 +$$

$$0.0235 + 0.0015 = 0.9985$$

84. between 21 and 46

$$0.0235 + 0.135 + 0.34 + 0.34 + 0.135 = 0.9735$$

85. greater than 36

$$0.34 + 0.135 + 0.0235 + 0.0015 = 0.5$$

### Chapter 13 (pp. 957-959)

1.  $x = \sqrt{7^2 + 7^2} = \sqrt{98}$

$$\sin \theta = \frac{7\sqrt{98}}{98} = \frac{\sqrt{2}}{2} \quad \csc \theta = \frac{\sqrt{98}}{7} = \sqrt{2}$$

$$\cos \theta = \frac{7\sqrt{98}}{98} = \frac{\sqrt{2}}{2} \quad \sec \theta = \frac{\sqrt{98}}{7} = \sqrt{2}$$

$$\tan \theta = \frac{7}{7} = 1 \quad \cot \theta = \frac{7}{7} = 1$$



## Extra Practice *continued*

$$2. x = \sqrt{2^2 + 3^2} = \sqrt{13}$$

$$\sin \theta = \frac{3\sqrt{13}}{13}$$

$$\cos \theta = \frac{2\sqrt{13}}{13}$$

$$\tan \theta = \frac{3}{2}$$

$$\csc \theta = \frac{\sqrt{13}}{3}$$

$$\sec \theta = \frac{\sqrt{13}}{2}$$

$$\cot \theta = \frac{2}{3}$$

$$3. x = \sqrt{9^2 - 5^2} = \sqrt{56}$$

$$\sin \theta = \frac{\sqrt{56}}{9} = \frac{2\sqrt{14}}{9}$$

$$\cos \theta = \frac{5}{9}$$

$$\tan \theta = \frac{\sqrt{56}}{5} = \frac{2\sqrt{14}}{5}$$

$$\csc \theta = \frac{9\sqrt{56}}{56} = \frac{9\sqrt{14}}{28}$$

$$\sec \theta = \frac{9}{5}$$

$$\cot \theta = \frac{5\sqrt{56}}{56} = \frac{5\sqrt{14}}{28}$$

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

$$\sin \theta = \frac{\sqrt{7}}{4}$$

$$\cos \theta = \frac{3}{4}$$

$$\tan \theta = \frac{\sqrt{7}}{3}$$

$$\csc \theta = \frac{4\sqrt{7}}{7}$$

$$\sec \theta = \frac{4}{3}$$

$$\cot \theta = \frac{3\sqrt{7}}{7}$$

Sample answers are given for 5–16

$$5. 35^\circ$$

$$35^\circ + 360^\circ = 395^\circ$$

$$35^\circ - 360^\circ = -325^\circ$$

$$7. 125^\circ$$

$$125^\circ + 360^\circ = 485^\circ$$

$$125^\circ - 360^\circ = -235^\circ$$

$$9. -45^\circ$$

$$-45^\circ + 360^\circ = 315^\circ$$

$$-45^\circ - 360^\circ = -405^\circ$$

$$11. 585^\circ$$

$$585^\circ - 360^\circ = 225^\circ$$

$$585^\circ - 720^\circ = -135^\circ$$

$$13. \frac{2\pi}{3}$$

$$\frac{2\pi}{3} + 2\pi = \frac{8\pi}{3}$$

$$\frac{2\pi}{3} - 2\pi = -\frac{4\pi}{3}$$

$$15. \frac{16\pi}{5}$$

$$\frac{16\pi}{5} - 2\pi = \frac{6\pi}{5}$$

$$\frac{16\pi}{5} + 4\pi = \frac{36\pi}{5}$$

$$6. -70^\circ$$

$$-70^\circ + 360^\circ = 290^\circ$$

$$-70^\circ - 360^\circ = -430^\circ$$

$$8. 2^\circ$$

$$2^\circ + 360^\circ = 362^\circ$$

$$2^\circ - 360^\circ = -358^\circ$$

$$10. 315^\circ$$

$$315^\circ + 360^\circ = 675^\circ$$

$$315^\circ - 360^\circ = -45^\circ$$

$$12. 600^\circ$$

$$600^\circ + 360^\circ = 960^\circ$$

$$600^\circ - 720^\circ = -120^\circ$$

$$14. \frac{11\pi}{2}$$

$$\frac{11\pi}{2} - 2\pi = \frac{7\pi}{2}$$

$$\frac{11\pi}{2} - 6\pi = -\frac{\pi}{2}$$

$$16. \frac{7\pi}{13}$$

$$\frac{7\pi}{13} - 2\pi = -\frac{19\pi}{13}$$

$$\frac{7\pi}{13} + 2\pi = \frac{33\pi}{13}$$

$$17. s = 4\left(\frac{\pi}{3}\right) = \frac{4\pi}{3} \text{ in.}$$

$$A = \frac{1}{2}4^2\left(\frac{\pi}{3}\right)$$

$$= \frac{8\pi}{3} \text{ in.}^2$$

$$18. s = 7\left(\frac{37\pi}{180}\right) = \frac{259\pi}{180} \text{ ft}$$

$$A = \frac{1}{2}7^2\left(\frac{37\pi}{180}\right)$$

$$= \frac{1813\pi}{360} \text{ ft}^2$$

$$19. s = 14\left(\frac{3\pi}{4}\right) = \frac{21\pi}{2} \text{ cm}$$

$$A = \frac{1}{2}14^2\left(\frac{3\pi}{4}\right)$$

$$= \frac{147\pi}{2} \text{ cm}^2$$

$$20. s = 120\left(\frac{167\pi}{180}\right) = \frac{334\pi}{3} \text{ m}$$

$$A = \frac{1}{2}120^2\left(\frac{167\pi}{180}\right)$$

$$= 6680\pi \text{ m}^2$$

$$21. s = 9\left(\frac{\pi}{45}\right) = \frac{\pi}{5} \text{ cm}$$

$$A = \frac{1}{2}9^2\left(\frac{\pi}{45}\right)$$

$$= \frac{9\pi}{10} \text{ cm}^2$$

$$22. s = 28\left(\frac{7\pi}{6}\right) = \frac{98\pi}{3} \text{ in.}$$

$$A = \frac{1}{2}28^2\left(\frac{7\pi}{6}\right)$$

$$= \frac{1372\pi}{3} \text{ in.}^2$$

$$23. x = 4; y = 5; r = \sqrt{4^2 + 5^2} = \sqrt{41}$$

$$\sin \theta = \frac{5\sqrt{41}}{41} \quad \csc \theta = \frac{\sqrt{41}}{5}$$

$$\cos \theta = \frac{4\sqrt{41}}{41} \quad \sec \theta = \frac{\sqrt{41}}{4}$$

$$\tan \theta = \frac{5}{4} \quad \cot \theta = \frac{4}{5}$$

$$24. x = 4; y = -1; r = \sqrt{4^2 + (-1)^2} = \sqrt{17}$$

$$\sin \theta = -\frac{\sqrt{17}}{17} \quad \csc \theta = -\sqrt{17}$$

$$\cos \theta = \frac{4\sqrt{17}}{17} \quad \sec \theta = \frac{\sqrt{17}}{4}$$

$$\tan \theta = -\frac{1}{4} \quad \cot \theta = -4$$

$$25. x = -2; y = -6; r = \sqrt{(-2)^2 + (-6)^2} = \sqrt{40}$$

$$\sin \theta = -\frac{3\sqrt{10}}{10} \quad \csc \theta = -\frac{\sqrt{10}}{3}$$

$$\cos \theta = -\frac{\sqrt{10}}{10} \quad \sec \theta = -\sqrt{10}$$

$$\tan \theta = 3 \quad \cot \theta = \frac{1}{3}$$



## Extra Practice *continued*

$$26. x = -12; y = \sqrt{3}; r = \sqrt{(-12)^2 + (\sqrt{3})^2} = \sqrt{147}$$

$$\sin \theta = \frac{\sqrt{441}}{147} \quad \csc \theta = \frac{\sqrt{441}}{3}$$

$$\cos \theta = -\frac{4\sqrt{147}}{49} \quad \sec \theta = -\frac{\sqrt{147}}{12}$$

$$\tan \theta = -\frac{\sqrt{3}}{12} \quad \cot \theta = -4\sqrt{3}$$

$$27. x = 6; y = 3; r = \sqrt{6^2 + 3^2} = \sqrt{45}$$

$$\sin \theta = \frac{\sqrt{45}}{15} \quad \csc \theta = \frac{\sqrt{45}}{3}$$

$$\cos \theta = \frac{2\sqrt{45}}{15} \quad \sec \theta = \frac{\sqrt{45}}{6}$$

$$\tan \theta = \frac{1}{2} \quad \cot \theta = 2$$

$$28. x = 5; y = -12; r = \sqrt{5^2 + (-12)^2} = 13$$

$$\sin \theta = -\frac{12}{13} \quad \csc \theta = -\frac{13}{12}$$

$$\cos \theta = \frac{5}{13} \quad \sec \theta = \frac{13}{5}$$

$$\tan \theta = -\frac{12}{5} \quad \cot \theta = -\frac{5}{12}$$

$$29. x = 3\sqrt{7}; y = -2; r = \sqrt{(3\sqrt{7})^2 + (-2)^2} = \sqrt{67}$$

$$\sin \theta = -\frac{2\sqrt{67}}{67} \quad \csc \theta = -\frac{\sqrt{67}}{2}$$

$$\cos \theta = \frac{3\sqrt{469}}{67} \quad \sec \theta = \frac{\sqrt{469}}{21}$$

$$\tan \theta = -\frac{2\sqrt{7}}{21} \quad \cot \theta = -\frac{3\sqrt{7}}{2}$$

$$30. x = \sqrt{2}; y = \sqrt{2}; r = \sqrt{(\sqrt{2})^2 + (\sqrt{2})^2} = 2$$

$$\sin \theta = \frac{\sqrt{2}}{2} \quad \csc \theta = \sqrt{2}$$

$$\cos \theta = \frac{\sqrt{2}}{2} \quad \sec \theta = \sqrt{2}$$

$$\tan \theta = 1 \quad \cot \theta = 1$$

$$31. x = 3; y = -5; r = \sqrt{3^2 + (-5)^2} = \sqrt{34}$$

$$\sin \theta = -\frac{5\sqrt{34}}{34} \quad \csc \theta = -\frac{\sqrt{34}}{5}$$

$$\cos \theta = \frac{3\sqrt{34}}{34} \quad \sec \theta = \frac{\sqrt{34}}{3}$$

$$\tan \theta = -\frac{5}{3} \quad \cot \theta = -\frac{3}{5}$$

$$32. x = 7; y = -8; r = \sqrt{7^2 + (-8)^2} = \sqrt{113}$$

$$\sin \theta = -\frac{8\sqrt{113}}{113} \quad \csc \theta = -\frac{\sqrt{113}}{8}$$

$$\cos \theta = \frac{7\sqrt{113}}{113} \quad \sec \theta = \frac{\sqrt{113}}{7}$$

$$\tan \theta = -\frac{8}{7} \quad \cot \theta = -\frac{7}{8}$$

$$33. x = -3; y = 6; r = \sqrt{(-3)^2 + 6^2} = \sqrt{45}$$

$$\sin \theta = \frac{2\sqrt{45}}{15} \quad \csc \theta = \frac{\sqrt{45}}{6}$$

$$\cos \theta = -\frac{\sqrt{45}}{15} \quad \sec \theta = -\frac{\sqrt{45}}{3}$$

$$\tan \theta = -2 \quad \cot \theta = -\frac{1}{2}$$

$$34. x = \sqrt{5}; y = 3; r = \sqrt{(\sqrt{5})^2 + 3^2} = \sqrt{14}$$

$$\sin \theta = \frac{3\sqrt{14}}{14} \quad \csc \theta = \frac{\sqrt{14}}{3}$$

$$\cos \theta = \frac{\sqrt{70}}{14} \quad \sec \theta = \frac{\sqrt{70}}{5}$$

$$\tan \theta = \frac{3\sqrt{5}}{5} \quad \cot \theta = \frac{\sqrt{5}}{3}$$

$$35. \sin(-390^\circ) = -\frac{1}{2} \quad 36. \sec 120^\circ = -2$$

$$37. \cos 315^\circ = \frac{\sqrt{2}}{2} \quad 38. \tan(-150^\circ) = \frac{\sqrt{3}}{3}$$

$$39. \cos \frac{7\pi}{4} = \frac{\sqrt{2}}{2} \quad 40. \tan \frac{7\pi}{6} = \frac{\sqrt{3}}{3}$$

$$41. \sin\left(-\frac{2\pi}{3}\right) = -\frac{\sqrt{3}}{2} \quad 42. \csc \frac{13\pi}{4} = -\sqrt{2}$$

$$43. \tan^{-1}(-1) = -45^\circ; -\frac{\pi}{4} \quad 44. \cos^{-1}0 = 90^\circ; \frac{\pi}{2}$$

$$45. \sin^{-1}\left(-\frac{1}{2}\right) = -30^\circ; -\frac{\pi}{6}$$

$$46. \cos^{-1}\left(-\frac{\sqrt{2}}{2}\right) = 135^\circ; \frac{3\pi}{4} \quad 47. \tan^{-1}\frac{\sqrt{3}}{3} = 30^\circ; \frac{\pi}{6}$$

$$48. \sin^{-1}\frac{1}{2} = 30^\circ; \frac{\pi}{6} \quad 49. \tan^{-1}\sqrt{3} = 60^\circ; \frac{\pi}{3}$$

$$50. \sin^{-1}\frac{\sqrt{3}}{2} = 60^\circ; \frac{\pi}{3}$$

$$51. \sin \theta = \frac{8}{12} = 41.8^\circ$$

$$\sin \theta = \frac{6}{12} = 30^\circ$$