

## Chapter 5 continued

$$77. A = \begin{bmatrix} 2 & -3 & -9 \\ 6 & 1 & -1 \\ 9 & -2 & 4 \end{bmatrix};$$

$$\det A = (8 + 27 + 108) - (-81 + 4 - 72) \\ = 143 + 149 = 292$$

$$x = \frac{\begin{vmatrix} 11 & -3 & -9 \\ 45 & 1 & -1 \\ 56 & -2 & 4 \end{vmatrix}}{292}$$

$$= \frac{(44 + 168 + 810) - (-504 + 22 - 540)}{292}$$

$$= \frac{1022 + 1022}{292} = 7$$

$$y = \frac{\begin{vmatrix} 2 & 11 & -9 \\ 6 & 45 & -1 \\ 9 & 56 & 4 \end{vmatrix}}{292}$$

$$= \frac{(360 - 99 - 3024) - (-3645 - 112 + 264)}{292}$$

$$= \frac{-2763 + 3493}{292} = 2.5$$

$$z = \frac{\begin{vmatrix} 2 & -3 & 11 \\ 6 & 1 & 45 \\ 9 & -2 & 56 \end{vmatrix}}{292}$$

$$= \frac{(112 - 1215 - 132) - (99 - 180 - 1008)}{292}$$

$$= \frac{-1235 + 1089}{292} = \frac{-146}{292} = -0.5$$

(7, 2.5, -0.5)

$$78. \frac{22 - 7}{14} = \frac{15}{14} = 1\frac{1}{14} \text{ ft per hr}$$

### Lesson 5.2

#### 5.2 Guided Practice (p. 260)

1. *Sample answer:* numbers where the value of the function is zero

2. The  $x$ -term is negative and its absolute value is greater than the absolute value of the constant term.

3. The student did not set the factors equal to zero.

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

$$x^2 + 4x - 5 = 0$$

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

$$x - 1 = 0 \quad x + 5 = 0$$

$$x = 1 \quad x = -5$$

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

5.  $2x^2 + x - 3 = (2x + 3)(x - 1)$

6.  $x^2 - 16 = (x - 4)(x + 4)$

7.  $y^2 + 2y + 1 = (y + 1)(y + 1)$

8.  $p^2 - 4p + 4 = (p - 2)(p - 2)$

9.  $q^2 + q = q(q + 1)$

10.  $x = -3 \quad x = 1$

11.  $(x - 4)(x + 2) = 0$

$$x - 4 = 0 \quad x + 2 = 0$$

$$x = 4 \quad x = -2$$

12.  $(3x + 1)(x + 3) = 0$

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

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

13.  $4u^2 - 1 = 0$

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

$$2u = 1 \quad 2u = -1$$

$$u = \frac{1}{2} \quad u = -\frac{1}{2}$$

14.  $v^2 - 14v + 49 = 0$

$$(v - 7)(v - 7) = 0$$

$$v = 7$$

15.  $5w^2 - 30w = 0$

$$5w(w - 6) = 0$$

$$w = 0 \quad w = 6$$

16.  $y = (x - 1)(x - 5);$

$$1, 5$$

17.  $y = (x + 2)(x + 4);$

$$-2, -4$$

18.  $y = (x - 1)(x + 1);$

$$1, -1$$

19.  $y = (x + 5)^2;$

$$-5$$

20.  $y = 2(x - 4)(x + 3);$

$$4, -3$$

21.  $y = (3x - 2)(x - 2);$

$$\frac{2}{3}, 2$$

22.  $(2x + 12)(2x + 8) - 96 = 96$

$$4x^2 + 40x = 96$$

$$4(x^2 + 10x - 24) = 0$$

$$4(x + 12)(x - 2) = 0$$

The width of the border is 2 ft.

#### 5.2 Practice and Applications (pp. 260–263)

23.  $x^2 + 5x + 4 = (x + 4)(x + 1)$

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

25.  $x^2 + 13x + 40 = (x + 5)(x + 8)$

26.  $x^2 - 4x + 3 = (x - 3)(x - 1)$

27.  $x^2 - 8x + 12 = (x - 6)(x - 2)$

28.  $x^2 - 16x + 51$  cannot be factored

29.  $a^2 + 3a - 10 = (a + 5)(a - 2)$

30.  $b^2 + 6b - 27 = (b + 9)(b - 3)$

31.  $c^2 + 2c - 80 = (c + 10)(c - 8)$

32.  $p^2 - 5p - 6 = (p - 6)(p + 1)$

33.  $q^2 - 7q - 10$  cannot be factored

34.  $r^2 - 14r - 72 = (r - 18)(r + 4)$

35.  $2x^2 + 7x + 3 = (2x + 1)(x + 3)$

36.  $3x^2 + 17x + 10 = (3x + 2)(x + 5)$

37.  $8x^2 + 18x + 9 = (4x + 3)(2x + 3)$

38.  $5x^2 - 7x + 2 = (5x - 2)(x - 1)$

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39.  $6x^2 - 9x + 5$  cannot be factored
40.  $10x^2 - 19x + 6 = (5x - 2)(2x - 3)$
41.  $3k^2 + 32k - 11 = (3k - 1)(k + 11)$
42.  $11m^2 + 14m - 16 = (11m - 8)(m + 2)$
43.  $18n^2 + 9n - 14 = (3n - 2)(6n + 7)$
44.  $7u^2 - 4u - 3 = (7u + 3)(u - 1)$
45.  $12v^2 - 25v - 7 = (3v - 7)(4v + 1)$
46.  $4w^2 - 13w - 27$  cannot be factored
47.  $x^2 - 25 = (x - 5)(x + 5)$
48.  $x^2 + 4x + 4 = (x + 2)^2$
49.  $x^2 - 6x + 9 = (x - 3)^2$
50.  $4r^2 - 4r + 1 = (2r - 1)^2$
51.  $9s^2 + 12s + 4 = (3s + 2)^2$
52.  $16t^2 - 9 = (4t - 3)(4t + 3)$
53.  $49 - 100a^2 = (7 - 10a)(7 + 10a)$
54.  $25b^2 - 60b + 36 = (5b - 6)^2$
55.  $81c^2 + 198c + 121 = (9c + 11)^2$
56.  $5(x^2 + x - 2) = 5(x + 2)(x - 1)$
57.  $2(9x^2 - 1) = 2(3x - 1)(3x + 1)$
58.  $3(x^2 + 18x + 81) = 3(x + 9)^2$
59.  $4(2y^2 - 7y - 15) = 4(2y + 3)(y - 5)$
60.  $7(16a^2 - 24a + 9) = 7(4a - 3)^2$
61.  $u(u + 7)$
62.  $6t(t - 6)$
63.  $-v^2 + 2v - 1 = -(v - 1)^2$
64.  $2(d^2 + 6d - 8)$
65.  $(x - 4)(x + 1) = 0$   
 $x = 4$   $x = -1$
66.  $(x + 11)(x + 8) = 0$   
 $x = -11$   $x = -8$
67.  $(5x - 3)(x - 2) = 0$   
 $x = \frac{3}{5}$   $x = 2$
68.  $(4x - 5)(2x + 1) = 0$   
 $x = \frac{5}{4}$   $x = -\frac{1}{2}$
69.  $(k + 12)^2 = 0$   
 $k = -12$
70.  $(3m - 5)^2 = 0$   
 $m = \frac{5}{3}$
71.  $(9n - 4)(9n + 4) = 0$   
 $n = \frac{4}{9}$   $n = -\frac{4}{9}$
72.  $4a(10a + 1) = 0$   
 $a = 0$   $a = -\frac{1}{10}$
73.  $-3(b + 5)(b - 6) = 0$   
 $b = -5$   $b = 6$
74.  $x^2 + 9x + 20 = 0$   
 $(x + 4)(x + 5) = 0$   
 $x = -4$   $x = -5$
75.  $16x^2 - 8x + 1 = 0$   
 $(4x - 1)^2 = 0$   
 $x = \frac{1}{4}$
76.  $p^2 - 49 = 0$   
 $(p - 7)(p + 7) = 0$   
 $p = 7$   $p = -7$
77.  $3y^2 - 5y - 8 = 0$   
 $(3y - 8)(y + 1) = 0$   
 $y = \frac{8}{3}$   $y = -1$
78.  $-5q^2 + 11q - 2 = 0$   
 $-(5q - 1)(q - 2) = 0$   
 $q = \frac{1}{5}$   $q = 2$
79.  $w^2 + 12w + 36 - 3w - 36 + w^2 = 0$   
 $2w^2 + 9w = 0$   
 $w(2w + 9) = 0$   
 $w = 0$   $w = -\frac{9}{2}$
80.  $y = (x - 2)(x - 1);$   
 $2, 1$
81.  $y = (x + 4)(x + 3);$   
 $-4, -3$
82.  $y = (x + 7)(x - 5);$   
 $-7, 5$
83.  $y = (x - 2)(x + 2);$   
 $2, -2$
84.  $y = (x + 10)^2;$   
 $-10$
85.  $y = x(x - 3);$   
 $0, 3$
86.  $y = 3(x^2 - 4x - 5)$   
 $y = 3(x - 5)(x + 1);$   
 $5, -1$
87.  $y = -(x - 8)^2;$   
 $8$
88.  $y = (2x - 1)(x - 4);$   
 $\frac{1}{2}, 4$
89. a.  $m + n = 0$   
 $mn = 9$   
b. If  $m + n = 0$ , then  $m = -n$ . Substituting in  $mn = 9$ ,  $(-n)(n) = 9$ ,  $-n^2 = 9$ , and  $n^2 = -9$ . There is no such number such that  $n^2 = -9$ . Therefore,  $x^2 + 9$  is not factorable.
90.  $(4 + 2x)(5 + 2x) - 20 = 10$   
 $20 + 8x + 4x^2 - 20 - 10 = 0$   
 $4x^2 + 18x - 10 = 0$   
 $(2x + 10)(2x - 1) = 0$   
 $x = \frac{1}{2}$   
 $0.5$  ft
91.  $(375 + x)(240 + x) - 90,000 = 40,500$   
 $x^2 + 615x - 40,500 = 0$   
 $(x - 60)(x + 675) = 0$   
 $x = 60$   
 $60$  ft
92.  $x^2 + 3x = 40$   
 $x^2 + 3x - 40 = 0$   
 $(x - 5)(x + 8) = 0$   
 $x = 5$
93.  $2x^2 + x = 105$   
 $2x^2 + x - 105 = 0$   
 $(2x + 15)(x - 7) = 0$   
 $x = 7$
94.  $\frac{1}{2}(3x^2 - x) = 22$   
 $3x^2 - x - 44 = 0$   
 $(3x + 11)(x - 4) = 0$   
 $x = 4$
95.  $\frac{1}{2}(6x + 2)(x) = 114$   
 $3x^2 + x - 114 = 0$   
 $(3x + 19)(x - 6) = 0$   
 $x = 6$