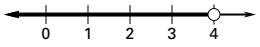
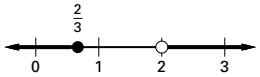
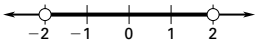
25. $x < 4$;



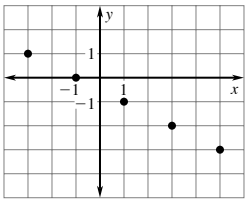
27. $x \leq \frac{2}{3}$ or $x > 2$;



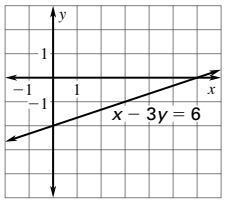
31. $-2 < x < 2$;



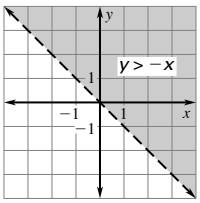
33.



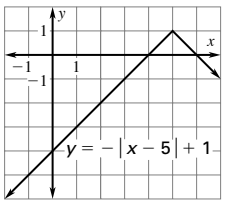
; yes **35.**



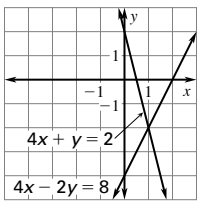
41.



45.



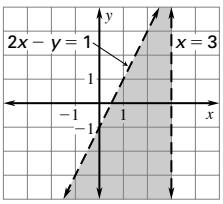
49.



;

one solution at $(1, -2)$

51.



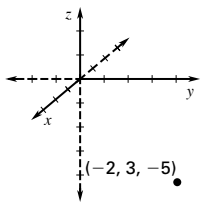
;

Solution region is to the right of $2x - y = 1$ and to the left of $x = 3$.

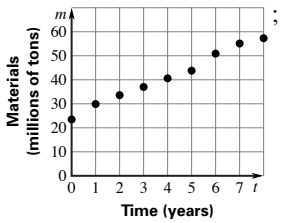
53. perpendicular **55.** $y = -3x + 7$ **57.** $y = \frac{1}{2}x + 1$

59. 11 **61.** −4 **63.** 2 **65.** $(4, -1)$ **67.** $(0, -1, 5)$

69.



75.



;

Sample answer: $y = 4.20t + 24.5$; about 83.3 million tons

77. Order 100 lb of vegetables and 50 lb of beef at a total cost of $228.50.

CHAPTER 4

SKILL REVIEW (p. 198) **1.** −1 **2.** −13 **3.** −14 **4.** 40 **5.** commutative property of multiplication **6.** commutative property of addition **7.** distributive property **8.** (15, 3) **9.** (−3, −10) **10.** $\left(\frac{112}{5}, -\frac{4}{5}\right)$ **11.** (−2, −2)

4.1 PRACTICE (pp. 203–205) **7.** $\begin{bmatrix} -7 & -12 & 12 \\ -5 & 12 & -10 \end{bmatrix}$

9. $\begin{bmatrix} -25 & -6 \\ -8 & 15 \end{bmatrix}$ **11.** not equal **13.** not equal **15.** $\begin{bmatrix} 4 & 1 \\ -12 & 4 \end{bmatrix}$

17. $\begin{bmatrix} -4 & -7 \\ 5 & 5 \end{bmatrix}$ **19.** $\begin{bmatrix} 5.3 & 12.2 \\ 2.8 & 10.4 \end{bmatrix}$ **21.** Not possible; the two matrices do not have the same dimensions.

23. $\begin{bmatrix} 4 & 12 & -28 \\ 16 & 0 & -24 \end{bmatrix}$ **25.** $\begin{bmatrix} 4 & 12 & 36 \\ -20 & 20 & 60 \\ -12 & -20 & -44 \end{bmatrix}$ **27.** $\begin{bmatrix} -1 & -1 & -2 \\ \frac{1}{8} & \frac{3}{11} & -5 \end{bmatrix}$

29. $\begin{bmatrix} 8 & -8 \\ 12 & -3 \\ -16 & 23 \end{bmatrix}$ **31.** $\begin{bmatrix} 22 & -30 \\ -22 & -18 \end{bmatrix}$ **33.** $x = -3, y = -8$

35. $x = -2, y = 44$ **37–41.** Matrices can also be written with the rows and columns switched.

37.

	Before		After	
	Wins	Losses	Wins	Losses
Atlanta Braves	59	29	47	27
Seattle Mariners	37	51	39	34
Chicago Cubs	48	39	42	34

39.

1996

	No. of units shipped (in mil)	$ Value (in mil)
CDs	20,779	$268,441
Cassettes	15,299	$122,329
Music Videos	45	$916

1997

	No. of units shipped (in mil)	$ Value (in mil)
CDs	26,277	$344,697
Cassettes	17,799	$144,645
Music Videos	70	$1,260

41. $\begin{bmatrix} 5{,}498 & \$76{,}256 \\ 2{,}500 & \$22{,}316 \\ 25 & \$344 \end{bmatrix}$ **43.** $2V + M$; $\begin{bmatrix} 146.8 & 148.4 \\ 146.1 & 147.8 \\ 146.8 & 148.4 \\ 146.2 & 148.1 \end{bmatrix}$

45.

Percent of Population in 1991

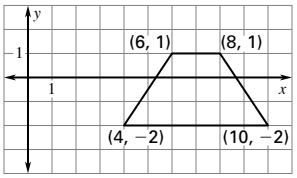
	0–17	18–65	over 65
Northeast	4.8	12.6	2.8
Midwest	6.3	14.5	3.1
South	8.9	21.2	4.3
Mountain	1.6	3.4	0.6
Pacific	4.2	9.9	1.7

Percent of Population in 2010

	0–17	18–65	over 65
Northeast	4.2	11.4	2.5
Midwest	5.3	13.8	3.0
South	8.5	22.6	5.0
Mountain	1.7	4.2	0.9
Pacific	4.6	10.5	1.9

47. South: 18–65, over 65, Mountain: 0–17, 18–65, over 65, Pacific: 0–17, 18–65, over 65

4.1 MIXED REVIEW (p. 206)

51. 

53. 20 **55.** 7 **57.** $\frac{5}{14}$
59. no, yes **61.** no, yes
63. *Sample answer:* (1, 2)
65. *Sample answer:* (5, 5)

TECHNOLOGY ACTIVITY 4.1 (p. 207)

1. $\begin{bmatrix} 6.6 & -6.1 \\ 15.33 & 1.72 \end{bmatrix}$ **3.** $\begin{bmatrix} 6.4666 & 1.6688 \\ 23.0503 & 7.301 \end{bmatrix}$

5. $\begin{bmatrix} -8 & -1 & 0 & -1 \\ -3 & -2 & -1 & 0 \end{bmatrix}$; none; Rock CDs, Country CDs, Easy Listening CDs, Rock tapes, Country tapes, Jazz tapes

4.2 PRACTICE (pp. 211–212)

5. defined; 3×3

7. $\begin{bmatrix} 2 & 0 \\ -5 & -3 \end{bmatrix}$ **9.** $\begin{bmatrix} -9 & -3 \\ 7 & 2 \\ 2 & 1 \end{bmatrix}$ **11.** defined; 1×2

13. not defined **15.** defined; 3×1 **17.** [2] **19.** $\begin{bmatrix} 4 & 11 \\ 12 & 3 \end{bmatrix}$

21. Not defined; the number of columns in the left matrix (3) does not equal the number of rows in the right matrix (2).

23. $\begin{bmatrix} -1.3 \\ 0.9 \end{bmatrix}$ **25.** $\begin{bmatrix} -32 & 0 & 32 \\ 12 & -26 & 1 \\ 20 & -30 & -5 \end{bmatrix}$ **27.** $\begin{bmatrix} 16 & -16 \\ 16 & -8 \end{bmatrix}$

29. $\begin{bmatrix} 8 & -5 & 8 \\ -1 & 1 & 1 \\ 7 & -30 & -35 \end{bmatrix}$ **31.** $\begin{bmatrix} 0 & -30 \\ 12 & -51 \end{bmatrix}$ **33.** $x = 2, y = 8$

35. $\begin{bmatrix} 0.201 & 0.348 & 0.180 \\ 0.220 & 0.215 & 0.017 \\ 0.073 & 0.001 & 0.005 \\ 0.113 & 0.014 & 0.405 \end{bmatrix}$ **37.** Matrix B $\begin{bmatrix} 6 \\ 5 \\ 4 \end{bmatrix}$

39. Team 3; 62 points

4.2 MIXED REVIEW (p. 213)

45. 180 m^2 **47.** 9π ft^2, or about 28.26 ft^2 **49.** $y = -\frac{1}{4}x + 4$ **51.** $y = 3x + 2$

53. $y = \frac{3}{2}x - 6$ **55.** $(-7, 5)$ **57.** no solution **59.** $(0, -5)$

61. $\left(-\frac{49}{37}, -\frac{52}{37}\right)$

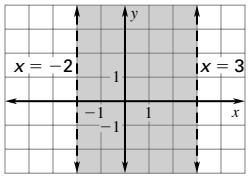
4.3 PRACTICE (pp. 218–220)

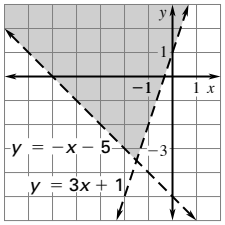
5. -6 **7.** 28 **9.** $(-5, 1)$
11. 1750 in.^{2} **13.** 24 **15.** 63 **17.** -31 **19.** 24 **21.** -77
23. 360 **25.** 116 **27.** 81 **29.** -732 **31.** 6 **33.** 11 **35.** 6
37. $(-2, -5)$ **39.** $(4, -1)$ **41.** $(6, 2)$ **43.** $\left(\frac{584}{11}, \frac{480}{11}\right)$
45. $(0, 5, 4)$ **47.** $\left(-\frac{2}{3}, -34, -12\right)$ **49.** $(4, 3, -2)$
51. $\left(\frac{1}{11}, \frac{34}{11}, \frac{19}{11}\right)$ **53.** $\left(-\frac{1}{44}, -\frac{69}{22}, -\frac{481}{88}\right)$ **55.** 144 ft^2
57. 4 in.^{2} **59.** regular: \$1.03 per gal, premium: \$1.15 per gal

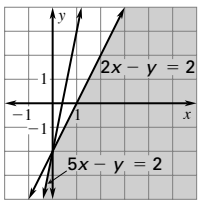
61. The determinant is multiplied by -1. Proof for 2×2 matrices: $-1\begin{vmatrix} a & b \\ c & d \end{vmatrix} = -1(ad - bc) = bc - ad = \begin{vmatrix} b & a \\ d & c \end{vmatrix}$

4.3 MIXED REVIEW (p. 221)

65. -3 **67.** 4 **69.** $\frac{5}{4}$

71. 

73. 

75. 

77. $\begin{bmatrix} -24 & 14 \\ 33 & -8 \end{bmatrix}$ **79.** $\begin{bmatrix} -104 & 35 \\ 32 & -4 \end{bmatrix}$

81. $\begin{bmatrix} 12 & 2.7 \\ 4 & 0.92 \end{bmatrix}$

QUIZ 1 (p. 221)

1. $\begin{bmatrix} -5 & 4 & 15 \\ 2 & -14 & 1 \end{bmatrix}$ **2.** $\begin{bmatrix} -5 & -7 \\ 0 & -1 \end{bmatrix}$

3. $\begin{bmatrix} -2 & -2 \\ -18 & -12 \end{bmatrix}$ **4.** $\begin{bmatrix} -4 & -2 & 22 \\ 3 & -18 & 20 \\ -17 & -4 & 1 \end{bmatrix}$ **5.** $\begin{bmatrix} 26 & 56 \\ 22 & 42 \end{bmatrix}$

6. $\begin{bmatrix} 5 & -15 \\ 38 & -12 \end{bmatrix}$ **7.** 10 **8.** 0 **9.** 70 **10.** -15 **11.** $(1, 2)$

12. $\left(\frac{4}{9}, -\frac{13}{3}\right)$ **13.** $\left(2, \frac{1}{2}\right)$ **14.** $\left(\frac{5}{2}, 1, -\frac{3}{2}\right)$ **15.** $\left(\frac{7}{3}, 10, -\frac{4}{3}\right)$

16. $(0, -4, 3)$ **17.** 12 ft^2

4.4 PRACTICE (pp. 227–228)

7. $\begin{bmatrix} -\frac{1}{3} & -\frac{2}{3} \\ 0 & -1 \end{bmatrix}$ **9.** $\begin{bmatrix} \frac{2}{65} & -\frac{32}{65} \\ \frac{16}{65} & \frac{4}{65} \end{bmatrix}$

11. $\begin{bmatrix} -0.0329 & 0.3289 \\ 0.5263 & -0.2632 \end{bmatrix}$ **13.** $\begin{bmatrix} 4 & 5 \\ 3 & 4 \end{bmatrix}$ **15.** $\begin{bmatrix} -7 & 8 \\ 1 & -1 \end{bmatrix}$

17. $\begin{bmatrix} 1 & -2 \\ -3 & 7 \end{bmatrix}$ **19.** $\begin{bmatrix} 1 & \frac{7}{2} \\ -1 & -3 \end{bmatrix}$ **21.** $\begin{bmatrix} \frac{1}{2} & \frac{1}{2} \\ \frac{3}{2} & \frac{11}{6} \end{bmatrix}$ **23.** $\begin{bmatrix} 5 & -1.25 \\ -4 & 1.1 \end{bmatrix}$

25. $\begin{bmatrix} \frac{37}{25} & -\frac{1}{5} \\ -\frac{4}{5} & 0 \end{bmatrix}$ **27.** $\begin{bmatrix} -4 & 2 & -7 \\ 3 & -1 & 5 \end{bmatrix}$ **29.** $\begin{bmatrix} \frac{17}{5} & \frac{136}{5} \\ -\frac{8}{5} & -\frac{64}{5} \end{bmatrix}$

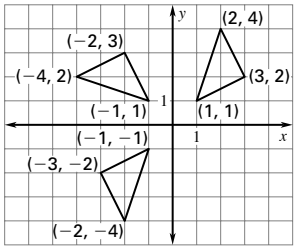
31. $\begin{bmatrix} 11 & -2 \\ 8 & -1.5 \end{bmatrix}$ **33.** no **35.** yes

37. $\begin{bmatrix} -0.0654 & -0.0131 & 0.1634 \\ 0.0131 & 0.2026 & -0.0327 \\ 0.1503 & -0.1699 & 0.1242 \end{bmatrix}$ **39.** $\begin{bmatrix} 12 & -7 & 3 \\ -20 & 12 & -5 \\ 1.5 & -1 & 0.5 \end{bmatrix}$

41. 39, 98, 26, 77, 20, 60, 13, 31, 23, 51
43. 36, −14, 16, 0, 125, −50, −26, 14, 10, 4, 24, −8, −95, 48
45. KARNAK TEMPLE **47.** THE GREAT SPHINX

SELECTED ANSWERS

49. a. $\begin{bmatrix} -1 & -4 & -2 \\ 1 & 2 & 3 \end{bmatrix}$; $\begin{bmatrix} -1 & -2 & -3 \\ -1 & -4 & -2 \end{bmatrix}$;



; 90° rotation

b. *Sample answer:* Find A^{-1} and then multiply AAT by A^{-1} on the left: $A^{-1}AAT = IAT = AT$. Now multiply AT by A^{-1} on the left: $A^{-1}AT = IT = T$.

4.4 Mixed Review (p. 229)

55. all real numbers **57.** $(4, 0, -2)$ **59.** $\left(\frac{1}{2}, 4, \frac{1}{4}\right)$

61. Not possible; the matrices have different dimensions.

63. $\begin{bmatrix} 17 & -3 & -1 \\ 0 & 25 & 31 \end{bmatrix}$ **65.** $\begin{bmatrix} 2 & 5 & 1 \\ 3 & 4 & 8 \end{bmatrix}$

4.5 Practice (pp. 233–235)

5. $\begin{bmatrix} 1 & 3 \\ 4 & -2 \end{bmatrix}\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 9 \\ 7 \end{bmatrix}$ **7.** $(-5, 7)$ **9.** $\left(\frac{21}{13}, -\frac{2}{13}\right)$

11. $\begin{bmatrix} 1 & 1 \\ 3 & -4 \end{bmatrix}\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 5 \\ 8 \end{bmatrix}$ **13.** $\begin{bmatrix} 5 & -3 \\ -4 & 2 \end{bmatrix}\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 9 \\ 10 \end{bmatrix}$

15. $\begin{bmatrix} 1 & 8 \\ 4 & -5 \end{bmatrix}\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 4 \\ -11 \end{bmatrix}$ **17.** $\begin{bmatrix} 1 & -4 & 5 \\ 2 & 1 & -7 \\ -4 & 5 & 2 \end{bmatrix}\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} -4 \\ -23 \\ 38 \end{bmatrix}$

19. $\begin{bmatrix} 0.5 & 3.1 & -0.2 \\ 1.2 & -2.5 & 0.7 \\ 0.3 & 4.8 & -4.3 \end{bmatrix}\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 5.9 \\ 2.2 \\ 4.8 \end{bmatrix}$

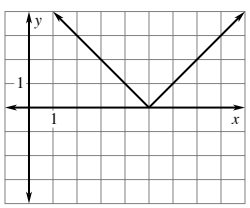
21. $\begin{bmatrix} 0 & 8 & -10 \\ 0 & 6 & -12 \\ -9 & 0 & 5 \end{bmatrix}\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} -23 \\ 14 \\ 0 \end{bmatrix}$ **23.** $(5, -7)$ **25.** $(5, -9)$

27. $(1, -7)$ **29.** $(-1, -4)$ **31.** $(-3, -14)$ **33.** $(-61, 179, -83)$ **35.** $(4, 3, 1)$ **37.** $(2, 3, -2)$ **39.** $(3, -2, 6)$ **41.** 2239.8 g of A, 1313.6 g of B, 4067.6 g of C **43.** transformer: \$10.00, wire: \$.20 per ft, light: \$1.00

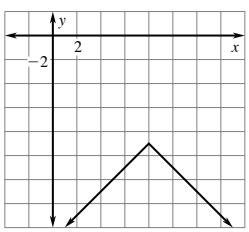
4.5 Mixed Review (p. 235)

47. -2 **49.** $-\frac{19}{2}$ **51.** 5 **53.** -3

55.



57.



61. $\begin{bmatrix} 3 & 4 \\ 5 & 7 \end{bmatrix}$ **65.** $\begin{bmatrix} 1 & -2 \\ -\frac{3}{2} & \frac{7}{2} \end{bmatrix}$

Quiz 2 (p. 236)

1. $\begin{bmatrix} 2 & -1 \\ -7 & 4 \end{bmatrix}$ **2.** $\begin{bmatrix} -3 & -5 \\ -4 & -7 \end{bmatrix}$ **3.** $\begin{bmatrix} -\frac{1}{3} & -\frac{1}{9} \\ -1 & -\frac{2}{3} \end{bmatrix}$ **4.** $\begin{bmatrix} \frac{7}{2} & -\frac{5}{2} \\ -4 & 3 \end{bmatrix}$

5. $(-1, 4)$ **6.** $(4, 3)$ **7.** $(3, -3)$ **8.** place setting: \$35.50, serving set: \$67.00

Chapter 4 Extension (p. 238)

1. $(-2, 5)$ **3.** $(-1, -4)$ **5.** $(4, -5)$ **7.** $(2, 1)$ **9.** $\left(0, \frac{1}{5}\right)$ **11.** $(16, -5, 2)$ **13.** $(-5, 2, 0)$ **15.** $(-16, 12, 10)$

Chapter 4 Review (pp. 240–242)

1. $\begin{bmatrix} 15 & -5 \\ 1 & 5 \end{bmatrix}$ **3.** $\begin{bmatrix} 8 & 11 \\ 9 & 13 \\ 8 & 6 \end{bmatrix}$ **5.** $\begin{bmatrix} 8 & 12 & -2 \\ 20 & -10 & 4 \\ 0 & 22 & 2 \end{bmatrix}$ **7.** $x = -1, y = 10$

9. $x = -1, y = 5$ **11.** $\begin{bmatrix} -120 & -84 \\ 40 & 28 \end{bmatrix}$ **13.** $\begin{bmatrix} 17 & -29 & 64 \\ 18 & -36 & 72 \end{bmatrix}$

15. 12 **17.** 4 **19.** $(-1, -1)$ **21.** $(6, 0, -3)$

23. $\begin{bmatrix} \frac{3}{4} & -\frac{1}{2} \\ -\frac{1}{4} & \frac{1}{2} \end{bmatrix}$ **25.** $\begin{bmatrix} 1 & 1 \\ 5 & 6 \end{bmatrix}$ **27.** $\begin{bmatrix} -3 & -2 \\ 4 & 3 \end{bmatrix}$ **29.** $\left(\frac{5}{2}, \frac{3}{2}\right)$

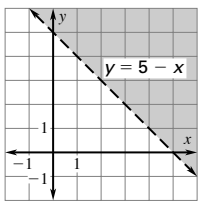
31. $(4, 1, 0)$ **33.** $(-3, 2, 4)$

CHAPTER 5

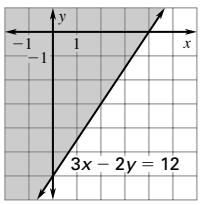
Skill Review (p. 248)

1. $\frac{5}{3}$ **2.** -3 **3.** 2

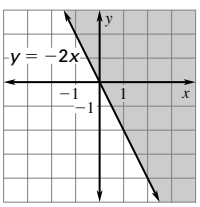
4.



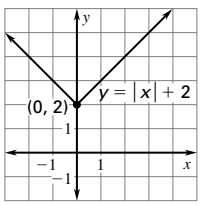
5.



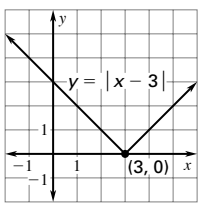
6.



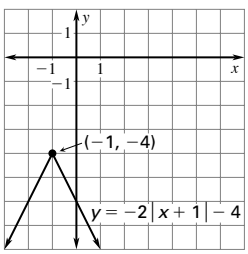
7.



8.

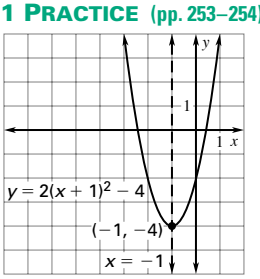


9.



5.1 Practice (pp. 253–254)

5.



7.