

11. $\{3, 4\}$ 12. $\left\{\frac{2+i\sqrt{3}}{2}, \frac{2-i\sqrt{3}}{2}\right\}$

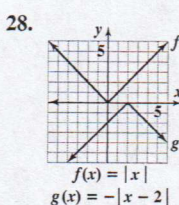
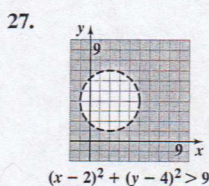
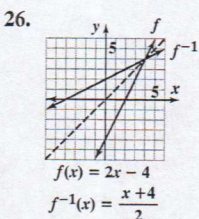
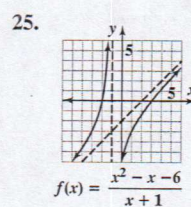
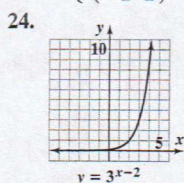
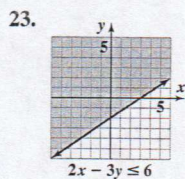
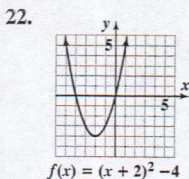
13. $(-18, 6)$ 14. $(1, 7)$

15. $\left\{-3, \frac{1}{2}, 2\right\}$ 16. $\{-2\}$

17. $\{2\}$ 18. $\{-2 + \log_3 11\}$

19. $\{625\}$ 20. $\left\{\left(-\frac{1}{2}, \frac{1}{2}\right), (2, 8)\right\}$

21. $\{(8, -2, -2)\}$



29. $(f \circ g)(x) = 2x^2 - 3x;$

$(g \circ f)(x) = -2x^2 + x + 2$

30. $4x + 2h - 1$

31. $y = -3x + 10$

32. $y = 3x + 3$

33. \$2600 at 12%; \$1400 at 14%

34. 4 m by 9 m

35. 10.99%

36. $\sec \theta - \cos \theta = \frac{1}{\cos \theta} - \cos \theta = \frac{1 - \cos^2 \theta}{\cos \theta} = \frac{\sin^2 \theta}{\cos \theta} = \frac{\sin \theta}{\cos \theta} \sin \theta = \tan \theta \sin \theta$

37. $\tan x + \tan y = \frac{\sin x}{\cos x} + \frac{\sin y}{\cos y} = \frac{\sin x \cos y + \sin y \cos x}{\cos x \cos y} = \frac{\sin(x+y)}{\cos x \cos y}$ 38. $\{0, \pi\}$ 39. $\left\{0, \frac{\pi}{3}, \frac{5\pi}{3}\right\}$ 40. 92.9

CHAPTER 9

Section 9.1

Check Point Exercises

1. a. $\begin{bmatrix} 1 & 6 & -3 & 7 \\ 4 & 12 & -20 & 8 \\ -3 & -2 & 1 & -9 \end{bmatrix}$ b. $\begin{bmatrix} 1 & 3 & -5 & 2 \\ 1 & 6 & -3 & 7 \\ -3 & -2 & 1 & -9 \end{bmatrix}$ c. $\begin{bmatrix} 4 & 12 & -20 & 8 \\ 1 & 6 & -3 & 7 \\ 0 & 16 & -8 & 12 \end{bmatrix}$ 2. $\{(5, 2, 3)\}$ 3. $\{(1, -1, 2, -3)\}$ 4. $\{(5, 2, 3)\}$

Exercise Set 9.1

1. $\begin{bmatrix} 2 & 1 & 2 & 2 \\ 3 & -5 & -1 & 4 \\ 1 & -2 & -3 & -6 \end{bmatrix}$ 2. $\begin{bmatrix} 3 & -2 & 5 & 31 \\ 1 & 3 & -3 & -12 \\ -2 & -5 & 3 & 11 \end{bmatrix}$ 3. $\begin{bmatrix} 1 & -1 & 1 & 8 \\ 0 & 1 & -12 & -15 \\ 0 & 0 & 1 & 1 \end{bmatrix}$ 4. $\begin{bmatrix} 1 & -2 & 3 & 9 \\ 0 & 1 & 3 & 5 \\ 0 & 0 & 1 & 2 \end{bmatrix}$ 5. $\begin{bmatrix} 5 & -2 & -3 & 0 \\ 1 & 1 & 0 & 5 \\ 2 & 0 & -3 & 4 \end{bmatrix}$

6. $\begin{bmatrix} 1 & -2 & 1 & 10 \\ 3 & 1 & 0 & 5 \\ 7 & 0 & 2 & 2 \end{bmatrix}$ 7. $\begin{bmatrix} 2 & 5 & -3 & 1 & 2 \\ 0 & 3 & 1 & 0 & 4 \\ 1 & -1 & 5 & 0 & 9 \\ 5 & -5 & -2 & 0 & 1 \end{bmatrix}$ 8. $\begin{bmatrix} 4 & 7 & -8 & 1 & 3 \\ 0 & 5 & 1 & 0 & 5 \\ 1 & -1 & -1 & 0 & 17 \\ 2 & -2 & -11 & 0 & 4 \end{bmatrix}$ 9. $5x + 3z = -11$
 $y - 4z = 12$
 $7x + 2y = 3$ 10. $7x + 4z = -13$
 $y - 5z = 11$
 $2x + 7y = 6$

11. $w + x + 4y + z = 3$
 $-w + x - y = 7$
 $2w + 5z = 11$
 $12y + 4z = 5$ 12. $4w + x + 5y + z = 6$
 $w - x - z = 8$
 $3w + 7z = 4$
 $11y + 5z = 3$ 13. $\begin{bmatrix} 1 & -3 & 2 & 5 \\ 1 & 5 & -5 & 0 \\ 3 & 0 & 4 & 7 \end{bmatrix}$ 14. $\begin{bmatrix} 1 & -4 & 2 & 3 \\ 1 & -4 & 4 & 0 \\ 2 & 0 & 7 & 4 \end{bmatrix}$ 15. $\begin{bmatrix} 1 & -3 & 2 & 0 \\ 0 & 10 & -7 & 7 \\ 2 & -2 & 1 & 3 \end{bmatrix}$

16. $\begin{bmatrix} 1 & -1 & 5 & -6 \\ 0 & 6 & -16 & 28 \\ 1 & 3 & 2 & 5 \end{bmatrix}$ 17. $\begin{bmatrix} 1 & -1 & 1 & 1 & 3 \\ 0 & 1 & -2 & -1 & 0 \\ 0 & 2 & 1 & 2 & 5 \\ 0 & 6 & -3 & -1 & -9 \end{bmatrix}$ 18. $\begin{bmatrix} 1 & -5 & 2 & -2 & 4 \\ 0 & 1 & -3 & -1 & 0 \\ 0 & 15 & -4 & 5 & -6 \\ 0 & -19 & 12 & -6 & 13 \end{bmatrix}$

19. $R_2: -3, -18; R_3: -12, -15; R_2: -\frac{3}{5}, -\frac{18}{5}; R_3: -12, -15$ 20. $R_2: -10, -5; R_3: 8, 10; R_2: -2, -1; R_3: 8, 10$ 21. $\{(1, -1, 2)\}$
 22. $\{(1, -1, 1)\}$ 23. $\{(3, -1, -1)\}$ 24. $\{(-3, 0, 1)\}$ 25. $\{(2, -1, 1)\}$ 26. $\{(4, -3, 2)\}$ 27. $\{(2, 1, 1)\}$ 28. $\{(0, 2, 2)\}$
 29. $\{(2, -1, 1)\}$ 30. $\{(1, 1, 2)\}$ 31. $\{(-1, 2, -2)\}$ 32. $\{(-1, 6, 3)\}$ 33. $\{(1, 2, -1)\}$ 34. $\{(2, 0, -1)\}$ 35. $\{(1, 2, 3, -2)\}$
 36. $\{(2, 1, -1, 3)\}$ 37. $\{(0, -3, 0, -3)\}$ 38. $\{(1, 3, 0, -2)\}$ 39. $f(x) = -x^2 + x + 2$ 40. $f(x) = x^2 - x + 3$ 41. $f(x) = x^3 - 2x^2 + 3$

42. $f(x) = -x^3 + 4x^2 - 2$ 43. $\{(e^{-1}, e, e^{-3}, e^{-2})\}$ 44. $\{(e, e^{-1}, e^2, e^{-3})\}$ 45. a. $a = -32, v_0 = 56, s_0 = 0$ b. 0; The ball hits the ground 3.5 seconds after it is thrown. c. 1.75 sec; 49 ft 46. a. $a = -32; v_0 = 128; s_0 = 6$ b. $s(7) = 118$; The ball's height is 118 feet after 7 seconds. c. 4 sec; 262 ft
47. $40x + 200y + 400z = 660$; 4 oz of Food A; $\frac{1}{2}$ oz of Food B; 1 oz of Food C
 $5x + 2y + 4z = 25$
 $30x + 10y + 300z = 425$
48. $2x + 3y + 2z = 100$; 15 children's models; 10 office models; 20 deluxe models
 $2x + y + 3z = 100$
 $x + y + 2z = 65$
49. Asians: 122; Africans: 28; Europeans: 24; Americans: 9 50. rooms: 132; bathrooms: 35; fireplaces: 28; elevators: 3
58. $\{(1, -1, 2, -2, 0)\}$ 59. makes sense 60. makes sense 61. makes sense 62. makes sense
63. false 64. false 65. false 66. false 67. 60 units; \$7700
68. For $z = 0$, $(12z + 1, 10z - 1, z)$ is $(1, -1, 0)$; $3(1) - 4(-1) + 4(0) = 7$ is true; $1 - (-1) - 2(0) = 2$ is true; $2(1) - 3(-1) + 6(0) = 5$ is true.
69. For $z = 1$, $(12z + 1, 10z - 1, z)$ is $(13, 9, 1)$; $3(13) - 4(9) + 4(1) = 7$ is true; $13 - 9 - 2(1) = 2$ is true; $2(13) - 3(9) + 6(1) = 5$ is true.
70. a. Answers may vary. b. This system has more than one solution.

Section 9.2

Check Point Exercises

1. \emptyset 2. $\{(11t + 13, 5t + 4, t)\}$ 3. $\{(t + 50, -2t + 10, t)\}$
4. a. $w + z = 15$ b. $\{(-t + 15, t + 15, -t + 30, t)\}$ c. $w = 5; x = 25; y = 20$
 $w + x = 30$
 $x + y = 45$
 $y + z = 30$

Exercise Set 9.2

1. \emptyset 2. \emptyset 3. $\left\{\left(-2t + 2, 2t + \frac{1}{2}, t\right)\right\}$ 4. $\{(-2 + t, -2 + t, t)\}$ 5. $\{(-3, 4, -2)\}$ 6. $\{(2, -3, 7)\}$ 7. $\{(5 - 2t, -2 + t, t)\}$
8. $\{(-5 + 7t, 1 + 3t, t)\}$ 9. $\{(-1, 2, 1, 1)\}$ 10. \emptyset 11. $\{(1, 3, 2, 1)\}$ 12. $\left\{\left(\frac{1}{3}t, \frac{2}{3}t, -\frac{1}{3}t, t\right)\right\}$ 13. $\{(1, -2, 1, 1)\}$ 14. $\{(1, -2, 3, -4)\}$
15. $\left\{\left(1 + \frac{1}{3}t, \frac{1}{3}t, t\right)\right\}$ 16. $\left\{\left(2, \frac{1}{2}t - \frac{1}{2}, t\right)\right\}$ 17. $\{(-13t + 5, 5t, t)\}$ 18. $\{(-2t + 3, -2t + 1, t)\}$ 19. $\left\{\left(2t - \frac{5}{4}, \frac{13}{4}, t\right)\right\}$
20. $\{(98, 2t - 43, t)\}$ 21. $\{(1, -t - 1, 2, t)\}$ 22. $\{(t + 3, 5t + 5, 3t + 4, t)\}$ 23. $\left\{\left(-\frac{2}{11}t + \frac{81}{11}, \frac{1}{22}t + \frac{10}{11}, \frac{4}{11}t - \frac{8}{11}, t\right)\right\}$
24. $\left\{\left(\frac{1}{3}t - \frac{2}{3}s, \frac{1}{3}t + \frac{1}{3}s, t, s\right)\right\}$
25. a. $4w - 2x + 2y - 3z = 0; 7w - x - y - 3z = 0; w + x + y - z = 0$ b. $\{(0.5t, 0, 0.5t, t)\}$
26. a. $2w + 17x - 23y + 40z = 0; 2w + 5x + y + 3z = 0; x - 2y + 3z = 0$ b. $\{(-5.5t, 2t, t, 0)\}$
27. a. $w + 2x + 5y + 5z = -3; w + x + 3y + 4z = -1; w - x - y + 2z = 3$ b. $\{(1 - 3s - t, -2 - s - 2t, t, s)\}$
28. a. $w + y + z = 0; w - x + 2y + 3z = 0; 3w - 2x + 5y + 7z = 0$ b. $\{(-s - t, 2s + t, t, s)\}$
29. $z + 12 = x + 6$ 30. $y + 6 = z + 8$ 31. $\{(t + 6, t + 2, t)\}$ 32. $x = 10, y = 6$
33. a. $w + z = 380$ b. $\{(380 - t, 220 + t, 50 + t, t)\}$ c. $w = 330, x = 270, y = 100$
 $w + x = 600$
 $x - y = 170$
 $y - z = 50$
34. a. There is no combination of the foods that can satisfy the given requirements.
 b. There are many combinations of the foods that satisfy the new requirements.
35. a. The system has no solution, so there is no way to satisfy these dietary requirements with no Food 1 available.
 b. 4 oz of Food 1, 0 oz of Food 2, 10 oz of Food 3; 2 oz of Food 1, 5 oz of Food 2, 9 oz of Food 3 (other answers are possible).
36. 7 of product A, 2 of product B, 2 of product C; 7 of product A, 1 of product B, 4 of product C (other answers are possible).
40. a. $x_1 - x_6 = 100$ b. $\{(t + 100, t - s + 600, -s + 900, t + 300, s - 200, t, s)\}$
 $x_2 - x_6 + x_7 = 600$
 $x_3 + x_7 = 900$
 $x_1 - x_4 = -200$
 $x_2 - x_4 + x_5 = 100$
 $x_3 + x_5 = 700$
41. does not make sense 42. makes sense 43. does not make sense 44. makes sense 45. $a = 1$ or $a = 3$ 47. -1 48. -12 49. 8

Section 9.3

Check Point Exercises

1. a. 3×2 b. $a_{12} = -2; a_{31} = 1$ 2. a. $\begin{bmatrix} 2 & 0 \\ 9 & -10 \end{bmatrix}$ b. $\begin{bmatrix} 9 & -4 \\ -9 & 7 \\ 5 & -2 \end{bmatrix}$ 3. a. $\begin{bmatrix} 6 & 12 \\ -48 & -30 \end{bmatrix}$ b. $\begin{bmatrix} -14 & -1 \\ 25 & 10 \end{bmatrix}$ 4. $\begin{bmatrix} -4 & 3 \\ -3 & \frac{13}{3} \end{bmatrix}$
5. $\begin{bmatrix} 7 & 6 \\ 13 & 12 \end{bmatrix}$ 6. $[30]; \begin{bmatrix} 2 & 0 & 4 \\ 6 & 0 & 12 \\ 14 & 0 & 28 \end{bmatrix}$ 7. a. $\begin{bmatrix} 2 & 18 & 11 & 9 \\ 0 & 10 & 8 & 2 \end{bmatrix}$ b. The product is undefined.