

Extra Practice

Chapter 12

Lesson 12-1

Find each sum or difference.

1.
$$\begin{bmatrix} -8 & 3 \\ 19 & -45 \end{bmatrix} + \begin{bmatrix} 12 & 64 \\ -7 & 63 \end{bmatrix}$$

2.
$$\begin{bmatrix} 3.6 & -9.8 \\ 4.0 & -1.7 \end{bmatrix} - \begin{bmatrix} 0.8 & 3.4 \\ -6.1 & 7.9 \end{bmatrix}$$

3.
$$\begin{bmatrix} 4 & 6 & -3 \\ 8 & -9 & -1 \end{bmatrix} + \begin{bmatrix} 10 & 7 & -3 \\ -9 & 2 & 7 \end{bmatrix}$$

4.
$$\begin{bmatrix} -308 & 651 \\ 912 & -347 \end{bmatrix} + \begin{bmatrix} 105 & 318 \\ -762 & -438 \end{bmatrix}$$

5.
$$\begin{bmatrix} 7 & -3 \\ 5 & 2 \end{bmatrix} + \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$$

6.
$$\begin{bmatrix} -2 & 9 \\ 0 & -4 \end{bmatrix} + \begin{bmatrix} 2 & -9 \\ 0 & 4 \end{bmatrix}$$

Solve each matrix equation.

7.
$$\begin{bmatrix} 25 & -60 \\ 42 & 91 \end{bmatrix} + X = \begin{bmatrix} -37 & 61 \\ 85 & 37 \end{bmatrix}$$

8.
$$\begin{bmatrix} -8 & 3 & 1 \\ -9 & 6 & 7 \end{bmatrix} - X = \begin{bmatrix} 5 & 8 & 3 \\ 4 & 2 & 6 \end{bmatrix}$$

9.
$$X + \begin{bmatrix} 6 & 2 & 9 \\ 1 & 5 & 10 \end{bmatrix} = \begin{bmatrix} 11 & -5 & 16 \\ 3 & 6 & 8 \end{bmatrix}$$

10.
$$X - \begin{bmatrix} 2.3 & 6.5 \\ 9.4 & -8.2 \end{bmatrix} = \begin{bmatrix} -4.7 & 3.6 \\ 9.4 & -5.8 \end{bmatrix}$$

Lesson 12-2

Solve each matrix equation. Check your answers.

11.
$$2 \begin{bmatrix} 2 & -7 \\ 8 & -4 \end{bmatrix} + 4X = \begin{bmatrix} 0 & -6 \\ 4 & -8 \end{bmatrix}$$

12.
$$0.5X + \begin{bmatrix} -5 & 3 \\ 0 & -2 \end{bmatrix} = \begin{bmatrix} -3 & 3.5 \\ -1 & -0.5 \end{bmatrix}$$

Extra Practice (continued)

Chapter 12

For exercises 13-24, use matrices A , B , C , and D shown below. Perform the indicated operations if they are defined. If an operation is not defined, label it *undefined*.

$$A = \begin{bmatrix} 8 & 1 \\ -2 & 5 \end{bmatrix}$$

$$B = \begin{bmatrix} -3 & 1 & 0 \\ -2 & -1 & 5 \end{bmatrix}$$

$$C = \begin{bmatrix} 9 & 4 \\ 5 & 1 \\ 2 & 0 \end{bmatrix}$$

$$D = \begin{bmatrix} 1 & 7 & 3 \\ 8 & 10 & -2 \end{bmatrix}$$

13. AB

14. BD

15. $2A$

16. CD

17. DA

18. $-3B$

19. $0.2A$

20. BA

21. $5C$

22. CB

23. $\frac{1}{2}D$

24. BC

25. A frozen yogurt supplier uses two machines to make chocolate and vanilla frozen yogurt. Both machines can be used in the morning and afternoon. Matrix A show the maximum hourly output of each machine. Matrix B shows how long the machines are used for production of each flavor.

Matrix A : **Output (gal/h)**Matrix B : **Time (h)**

Chocolate Vanilla

A.M. P.M.

$$\begin{array}{l} \text{Machine 1} \\ \text{Machine 2} \end{array} \begin{bmatrix} 4 & 5 \\ 7 & 8 \end{bmatrix}$$

$$\begin{array}{l} \text{Chocolate} \\ \text{Vanilla} \end{array} \begin{bmatrix} 2 & 3 \\ 1 & 2 \end{bmatrix}$$

- Compute the product AB of these matrices.
- Describe what this product represents.

Lesson 12-3

Determine whether the matrices are multiplicative inverses.

$$26. \begin{bmatrix} \frac{1}{3} & \frac{2}{3} \\ 1 & \frac{4}{3} \end{bmatrix}, \begin{bmatrix} -6 & 3 \\ \frac{9}{2} & -\frac{4}{3} \end{bmatrix}$$

$$27. \begin{bmatrix} 2 & 4 \\ 1 & 2 \end{bmatrix}, \begin{bmatrix} \frac{1}{2} & \frac{1}{4} \\ 1 & \frac{1}{2} \end{bmatrix}$$

Extra Practice (continued)**Chapter 12****Evaluate the determinant of each matrix.**

28. $\begin{bmatrix} 2 & 4 \\ 2 & -3 \end{bmatrix}$

29. $\begin{bmatrix} 5 & -2 \\ -1 & 3 \end{bmatrix}$

30. $\begin{bmatrix} -2 & -7 \\ 0 & 4 \end{bmatrix}$

31. $\begin{bmatrix} -2 & 3 \\ 9 & -1 \end{bmatrix}$

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

33. $\begin{bmatrix} 0.5 & -3 \\ -1.5 & 4 \end{bmatrix}$

34. $\begin{bmatrix} 4 & -1 & 5 \\ 2 & 0 & -1 \\ -3 & 2 & 1 \end{bmatrix}$

35. $\begin{bmatrix} 0 & -2 & 7 \\ 1 & -1 & 0 \\ 3 & 8 & -1 \end{bmatrix}$

36. $\begin{bmatrix} 1 & 2.5 & -7 \\ 3 & -1 & 0.5 \\ 5.5 & -2 & 0 \end{bmatrix}$

Determine whether each matrix has an inverse. If an inverse matrix exists, find it.

37. $\begin{bmatrix} 3 & 1 \\ -6 & -2 \end{bmatrix}$

38. $\begin{bmatrix} 2 & -1 \\ 4 & 2 \end{bmatrix}$

39. $\begin{bmatrix} 6 & 9 \\ 2 & 3 \end{bmatrix}$

40. What is the area of the triangle with vertices (3, 4), (5, -2), and (-1, 8)?

Lesson 12-4**Solve each matrix equation. If an equation cannot be solved, explain why.**

41. $\begin{bmatrix} 2 & 1 \\ -1 & 7 \end{bmatrix} X = \begin{bmatrix} 8 & 1 \\ -12 & 41 \end{bmatrix}$

42. $\begin{bmatrix} -1 & 0 \\ 6 & 3 \end{bmatrix} X = \begin{bmatrix} -9 \\ -3 \end{bmatrix}$

43. $\begin{bmatrix} -3 & 5 \\ 1 & 8 \end{bmatrix} X = \begin{bmatrix} 29 \\ 58 \end{bmatrix}$

Solve each system of equations using a matrix equation. Check your answers.

44. $\begin{cases} x - y = 3 \\ x + y = 5 \end{cases}$

45. $\begin{cases} x - 2y = 7 \\ x + 3y = 12 \end{cases}$

46. $\begin{cases} 2x + 5y = 10 \\ x + y = 2 \end{cases}$

47. County economists calculated that, in an average year, 9% of employed people lose their jobs and 86% of the unemployed find new jobs. The remaining people remain employed or unemployed, depending on their previous status. On January 1, the county has an unemployment rate of 7%. Calculate the expected unemployment rate for the next two years to the nearest tenth of a percent.

48. Leona's Diner offers 8-piece, 12-piece, and 16-piece family chicken meals. The table at the right lists the costs of three different orders. What is the price of each kind of meal?

8-piece meals	12-piece meals	16-piece meals	Total Cost
2	3	1	\$96
4	5	0	\$133
2	4	2	\$134

49. At a diner, two hot dogs and one hamburger cost \$10, while three hot dogs and two hamburgers cost \$17.25. Write and solve a matrix equation to find the cost of a hot dog and the cost of a hamburger.

Extra Practice (continued)

Chapter 12

Lesson 12-5

Use $\triangle ABC$ with coordinates $A(1, 5)$, $B(2, -1)$, and $C(4, 3)$. Write the coordinates of each image in matrix form.

50. a dilation 5 times the size

51. a translation 3 units left and 1 unit up

52. a translation 2 units right and 7 units down

53. a dilation one third the size

54. The matrix $\begin{bmatrix} \frac{\sqrt{3}}{2} & -\frac{1}{2} \\ \frac{1}{2} & \frac{\sqrt{3}}{2} \end{bmatrix}$ represents a 30° counterclockwise rotation. The

preimage is $\triangle ABC$ with the vertices $A(1, 1)$, $B(1, 2)$, and $C(5, 4)$. Write a matrix for the vertices of the image.

Lesson 12-6

Transform each vector as described. Write the resulting vector in component form.

55. $\langle 7, -2 \rangle$; rotate 90°

56. $\langle 4, 3 \rangle$; rotate 180°

57. $\langle -2, -5 \rangle$; rotate 270°

58. $\langle 1, -6 \rangle$; reflect across y-axis

Let $\mathbf{q} = \langle 1, 3 \rangle$, $\mathbf{r} = \langle 4, -3 \rangle$, and $\mathbf{s} = \langle -9, 4 \rangle$. Find the component forms of the following vectors.

59. $\mathbf{q} + \mathbf{s}$

60. $\mathbf{r} - \mathbf{s}$

61. $-3\mathbf{q}$

Determine whether the vectors in each pair are normal.

62. $\mathbf{a} = \langle -9, 3 \rangle$, $\mathbf{b} = \langle 2, 6 \rangle$

63. $\mathbf{c} = \langle -4, 3 \rangle$, $\mathbf{d} = \langle 6, -8 \rangle$

64. $\begin{bmatrix} 12 \\ 4 \end{bmatrix}$ and $\begin{bmatrix} -2 \\ 6 \end{bmatrix}$

65. $\begin{bmatrix} 7 \\ 14 \end{bmatrix}$ and $\begin{bmatrix} -14 \\ -7 \end{bmatrix}$

66. A boat travels east at a speed of 25 mi/h. Suppose the boat encounters a current moving south at 2 mi/h. What is the resultant speed of the boat?