



Chapter 2 Review

2.1

- If $A = \begin{bmatrix} -9 & 9 \\ 5 & -9 \\ 3 & 4 \end{bmatrix}$, what is $4A$?
- Given $A = \begin{bmatrix} 3 & 6 & 8 \\ 2 & 6 & 4 \end{bmatrix}$, and $B = \begin{bmatrix} -3 & 9 & 8 \\ 2 & -6 & 9 \end{bmatrix}$, compute the following.
 - $A + B$
 - $2A - 3B$
- Let $A = \begin{bmatrix} 9 & 9 \\ 7 & 8 \end{bmatrix}$, $B = \begin{bmatrix} -9 & 7 \\ -3 & 8 \end{bmatrix}$, and $C = \begin{bmatrix} 4 & 3 \\ 7 & 5 \end{bmatrix}$. Find the following.
 - A^T
 - $A + B^T$
 - $A - B + C^T$

- For $A = \begin{bmatrix} 4 & 0 & -1 \\ 3 & 1 & 3 \\ 0 & -3 & 2 \end{bmatrix}$ and $B = \begin{bmatrix} 4 & 2 & -3 \\ 2 & 4 & -3 \\ 2 & -3 & -3 \end{bmatrix}$, find $2A + B^T$.

- Solve for x, y, z , and w .

$$\begin{bmatrix} x & 4 \\ 4y & w \end{bmatrix} - \begin{bmatrix} 4x & 2z \\ -3 & -2w \end{bmatrix} = \begin{bmatrix} 12 & 8 \\ y & 6 \end{bmatrix}$$

2.2

- Let A be a 2×2 matrix, B is size 3×2 and C is a 3×3 matrix. Determine the size of the following matrices, if it's possible to perform the operation. Otherwise, state it's impossible.
 - AB
 - BA
 - AB^T
 - BC
 - ABC
 - CBA
 - B^TC
 - BC^T

- Let $A = \begin{bmatrix} 9 & 1 & 7 \\ 7 & -1 & 8 \end{bmatrix}$ and $B = \begin{bmatrix} 5 & 0 \\ 8 & -8 \\ 6 & 6 \end{bmatrix}$.

Compute the following, if possible.

- AB
- B^TA^T

- Let $A = \begin{bmatrix} 5 & 5 \\ -5 & 5 \end{bmatrix}$ and $B = \begin{bmatrix} 3 & -1 \\ 2 & 4 \end{bmatrix}$.

Compute the following, if possible.

- AB
- BA
- A^TB^T

2 Chapter 2 Review

9. Let $A = \begin{bmatrix} 1 & 4 & 9 \\ 0 & 1 & 5 \\ 0 & 0 & 2 \end{bmatrix}$.

Compute the following, if possible.

a. A^2

b. A^3

10. Let $A = \begin{bmatrix} -3 & -3 & -3 \\ 0 & -2 & -2 \\ 1 & 2 & 0 \end{bmatrix}$ and $B = \begin{bmatrix} 1 \\ 2 \\ 5 \end{bmatrix}$.

Compute the following, if possible.

a. AB

b. BA

c. $B^T A$

d. $A^T B$

2.3

Solve these systems of linear equations.

11. $4x - 5y - 5z = -6$
 $x + 6y - 6z = 32$
 $4x - 3y + 6z = -46$

12. $3x + 2y + z = 0$
 $x + y + 2z = 0$
 $2x + y - z = -1$

13. $2x - 5y + z = -9$
 $x + 4y - 6z = 2$
 $3x - 4y - 2z = -10$

14. $2x + y - z = 9$
 $3x - y = 0$
 $x + 2y + 3z = -6$

15. $x + 2y + 5z = -5$
 $4y - z = 2$
 $3x + y + z = 13$

16. $3x - y = -1$
 $x + y + z = 6$
 $5x + y + 2z = 11$

2.4

Find the inverse matrix, A^{-1} , for each matrix, if it exists. If it is not possible to find its inverse, state the reason why.

17. $A = \begin{bmatrix} 1 & -2 \\ 1 & 3 \end{bmatrix}$

18. $A = \begin{bmatrix} 3 & 0 & -3 \\ 1 & 1 & 2 \\ 1 & 2 & 1 \end{bmatrix}$

19. $A = \begin{bmatrix} 5 & 4 \\ -1 & 0 \end{bmatrix}$

20. $A = \begin{bmatrix} 2 & 3 & 1 \\ -1 & 0 & 5 \end{bmatrix}$

21. $A = \begin{bmatrix} 2 & 3 & 4 \\ 1 & 2 & 2 \\ 1 & 1 & 2 \end{bmatrix}$

22. $A = \begin{bmatrix} 2 & -5 & 1 \\ 1 & 4 & -6 \\ 3 & -4 & -2 \end{bmatrix}$

23. $A = \begin{bmatrix} 3 & 1 & 0 \\ 2 & -2 & 1 \\ 1 & 1 & 2 \end{bmatrix}$

24. Use $A^{-1} = \begin{bmatrix} 3 & 0 & -3 \\ 1 & 1 & 2 \\ 1 & 2 & 1 \end{bmatrix}$ to solve $AX = \begin{bmatrix} -2 \\ 5 \\ 4 \end{bmatrix}$ for X .

2.5

25. Encrypt the message "math is fun" using the encryption matrix

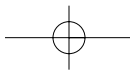
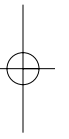
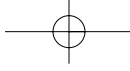
$$A = \begin{bmatrix} 1 & -2 & 3 \\ -4 & 5 & -6 \\ 3 & -2 & 2 \end{bmatrix}$$

26. Decrypt the message

$$\begin{array}{cccccccc} 28 & -55 & 22 & 58 & -139 & 68 & 39 & -69 \\ 20 & -21 & 60 & -26 & 68 & -134 & 45 & \end{array}$$

using the inverse of the encryption matrix from problem 25.

27. A brokerage house offers three stock portfolios. Portfolio 1 consists of two blocks of common stock and one municipal bond. Portfolio 2 consists of four blocks of common stock, two municipal bonds and three blocks of preferred stock. Portfolio 3 consists of seven blocks of common stock, three municipal bonds and three blocks of preferred stock. A customer wants 21 blocks of common stock, 10 municipal bonds and 9 blocks of preferred stock. How many of each Portfolio should be purchased for this customer?
28. A dietician is planning a meal that supplies 3225 mg of vitamin C, 2120 mg of calcium and 1255 mg of vitamin D. Three foods will be used. In food 1, there are 50 mg of vitamin C, 20 mg calcium and 10 mg of vitamin D. In food 2, there are 25 mg vitamin C, 20 mg calcium, and 15 mg vitamin D. Food 3 has 25 mg vitamin C, 30 mg calcium, and 15 mg vitamin D. What quantities of foods 1, 2 & 3 must be combined to form the desired mixture of these vitamins?
29. A grocer mixes peanuts, cashews, and almonds to obtain a 24-ounce package worth \$7.16. If peanuts, cashews and almonds cost \$0.19, \$0.40 and \$0.50 per ounce, respectively, and the amount of cashews in the mix is equal to the amount of almonds, how many ounces of each nut are in the package?
30. Marla's company needs to borrow \$80,000 for start-up costs. Three of her family members are willing to pitch in and loan her the money for a year. However, no one person has the total sum (or even half of it). Marla's sister is willing to loan money at 8% simple interest; her brother will charge 6.5% simple interest; and Marla's parents will charge 7.2% interest. Marla is only willing to pay a total of 7.1525% interest on the borrowed sum. Marla decides she will borrow twice as much from her parents than she borrows from her sister. How much should she borrow from each of her family members?



CHAPTER 2 REVIEW ANSWER KEY

1. $\begin{bmatrix} -36 & 36 \\ 20 & -36 \\ 12 & 16 \end{bmatrix}$
2. a. $\begin{bmatrix} 0 & 15 & 16 \\ 4 & 0 & 13 \end{bmatrix}$ b. $\begin{bmatrix} 15 & -15 & -8 \\ -2 & 30 & -19 \end{bmatrix}$
3. a. $\begin{bmatrix} 9 & 7 \\ 9 & 8 \end{bmatrix}$ b. $\begin{bmatrix} 0 & 6 \\ 14 & 16 \end{bmatrix}$ c. $\begin{bmatrix} 22 & 9 \\ 13 & 5 \end{bmatrix}$
4. $\begin{bmatrix} 12 & 2 & 0 \\ 8 & 6 & 3 \\ -3 & -3 & 7 \end{bmatrix}$
5. $x = -4, y = -1, z = -2, w = 2$
6. a. impossible
b. 3×2
c. 2×3
d. impossible
e. impossible
f. 3×2
g. 2×3
h. impossible
7. a. $\begin{bmatrix} 95 & 34 \\ 75 & 56 \end{bmatrix}$ b. $\begin{bmatrix} 95 & 75 \\ 34 & 56 \end{bmatrix}$
8. a. $\begin{bmatrix} 25 & 15 \\ -5 & 25 \end{bmatrix}$ b. $\begin{bmatrix} 20 & 10 \\ -10 & 30 \end{bmatrix}$ c. $\begin{bmatrix} 20 & -10 \\ 10 & 30 \end{bmatrix}$
9. a. $\begin{bmatrix} 1 & 8 & 47 \\ 0 & 1 & 15 \\ 0 & 0 & 4 \end{bmatrix}$ b. $\begin{bmatrix} 1 & 12 & 143 \\ 0 & 1 & 35 \\ 0 & 0 & 8 \end{bmatrix}$
10. a. $\begin{bmatrix} -24 \\ -14 \\ 5 \end{bmatrix}$
b. impossible
c. $[2 \ 3 \ -7]$
d. $\begin{bmatrix} 2 \\ 3 \\ -7 \end{bmatrix}$
11. $(-4, 2, -4)$
12. N.S.
13. $(1 + 5a, 1 + a, a)$
14. $(1, 3, -4)$
15. $(5, 0, -2)$
16. $(a, 3a + 1, 5 - 4a)$
17. $A^{-1} = \begin{bmatrix} \frac{3}{5} & \frac{2}{5} \\ -\frac{1}{5} & \frac{1}{5} \end{bmatrix}$
18. $A^{-1} = \begin{bmatrix} \frac{1}{4} & \frac{1}{2} & -\frac{1}{4} \\ -\frac{1}{12} & -\frac{1}{2} & \frac{3}{4} \\ -\frac{1}{12} & \frac{1}{2} & -\frac{1}{4} \end{bmatrix}$ or $\frac{1}{12} \begin{bmatrix} 3 & 6 & -3 \\ -1 & -6 & 9 \\ -1 & 6 & -3 \end{bmatrix}$
19. $A^{-1} = \begin{bmatrix} 0 & -1 \\ \frac{1}{4} & \frac{5}{4} \end{bmatrix}$
20. not possible; A is not a square matrix
21. DNE
22. DNE
23. $A^{-1} = \begin{bmatrix} \frac{5}{18} & \frac{1}{9} & -\frac{1}{18} \\ \frac{1}{6} & -\frac{1}{3} & \frac{1}{6} \\ -\frac{2}{9} & \frac{1}{9} & \frac{4}{9} \end{bmatrix}$ or $\frac{1}{18} \begin{bmatrix} 5 & 2 & -1 \\ 3 & -6 & 3 \\ -4 & 2 & 8 \end{bmatrix}$
24. $X = \begin{bmatrix} -18 \\ 11 \\ 12 \end{bmatrix}$
25. 71 -167 77 35 -86 42 37 -112 69 -7 -14 34
26. DINNER IS READY
27. 3 of Portfolio 1, 2 of Portfolio 2 and 1 of Portfolio 3
28. 29 mg food 1, 49 mg food 2, 22 mg food 3
29. 14 oz. peanuts, 5 oz. cashews, 5 oz. almonds
30. \$18,000 from her sister, \$26,000 from her brother, and \$36,000 from her parents

