

Student: Cole Lamers
Date: 06/29/19

Instructor: Kelly Galarneau
Course: CA&T Internet (70263)
Galarneau

Assignment: 9.2 Matrix Algebra

1. The product of a $1 \times n$ matrix A and an $n \times 1$ matrix B is a(n) _____ matrix.

The product of a $1 \times n$ matrix A and an $n \times 1$ matrix B is a(n) 1×1 matrix.

2. Determine the values of x and y that make the matrix equation true.

$$\begin{bmatrix} x \\ 0 \end{bmatrix} = \begin{bmatrix} 3 \\ y \end{bmatrix}$$

Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- ☒ A. $x =$, $y =$
- ☐ B. There is no solution.

3. Find x and y.

$$\begin{bmatrix} 4 & -3x \\ y & 4 \end{bmatrix} = \begin{bmatrix} 4 & -12 \\ -5 & 4 \end{bmatrix}$$

Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- ☒ A. $x =$, $y =$
- ☐ B. There is no solution.

4. Find the values of x and y for the following.

$$\begin{bmatrix} 4x - 3y & -3 \\ 2 & 2x + y \end{bmatrix} = \begin{bmatrix} 2 & -3 \\ 2 & 6 \end{bmatrix}$$

Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- ☒ A. $x =$, $y =$
- ☐ B. There is no solution.

5. Find each of the values to the right, if possible, with the given matrices below.

$$A = \begin{bmatrix} 2 & 2 \\ 4 & 4 \end{bmatrix} \quad B = \begin{bmatrix} -2 & 0 \\ 3 & -5 \end{bmatrix}$$

a. $A + B$

b. $A - B$

c. $-2A$

d. $2A - 3B$

e. $(A + B)^2$

f. $A^2 - B^2$

- a. Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

☒ A. $A + B = \begin{bmatrix} 0 & 2 \\ 7 & -1 \end{bmatrix}$

- ☐ B. This matrix operation is not possible.

- b. Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

☒ A. $A - B = \begin{bmatrix} 4 & 2 \\ 1 & 9 \end{bmatrix}$

- ☐ B. This matrix operation is not possible.

- c. Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

☒ A. $-2A = \begin{bmatrix} -4 & -4 \\ -8 & -8 \end{bmatrix}$

- ☐ B. This matrix operation is not possible.

- d. Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

☒ A. $2A - 3B = \begin{bmatrix} 10 & 4 \\ -1 & 23 \end{bmatrix}$

- ☐ B. This matrix operation is not possible.

- e. Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

☒ A. $(A + B)^2 = \begin{bmatrix} 14 & -2 \\ -7 & 15 \end{bmatrix}$

- ☐ B. This matrix operation is not possible.

- f. Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

☒ A. $A^2 - B^2 = \begin{bmatrix} 8 & 12 \\ 45 & -1 \end{bmatrix}$

- ☐ B. This matrix operation is not possible.

6. Find each of the values to the right, if possible, with the given matrices below.

$$A = \begin{bmatrix} 5 & 3 & -6 \\ 2 & 3 & 4 \\ 7 & -1 & 0 \end{bmatrix} \quad B = \begin{bmatrix} 3 & 2 & 0 \\ 1 & -1 & 3 \\ 4 & 1 & 6 \end{bmatrix}$$

a. $A + B$

b. $A - B$

c. $-3A$

d. $3A - 2B$

e. $(A + B)^2$

f. $A^2 - B^2$

- a. Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

☒ A. $A + B = \begin{bmatrix} 8 & 5 & -6 \\ 3 & 2 & 7 \\ 11 & 0 & 6 \end{bmatrix}$

- ☐ B. This matrix operation is not possible.

- b. Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

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

- ☐ B. This matrix operation is not possible.

- c. Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

☒ A. $-3A = \begin{bmatrix} -15 & -9 & 18 \\ -6 & -9 & -12 \\ -21 & 3 & 0 \end{bmatrix}$

- ☐ B. This matrix operation is not possible.

- d. Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

☒ A. $3A - 2B = \begin{bmatrix} 9 & 5 & -18 \\ 4 & 11 & 6 \\ 13 & -5 & -12 \end{bmatrix}$

- ☐ B. This matrix operation is not possible.

- e. Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

☒ A. $(A + B)^2 = \begin{bmatrix} 13 & 50 & -49 \\ 107 & 19 & 38 \\ 154 & 55 & -30 \end{bmatrix}$

- ☐ B. This matrix operation is not possible.

- f. Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

☒ A. $A^2 - B^2 = \begin{bmatrix} -22 & 26 & -24 \\ 30 & 5 & -15 \\ -4 & 5 & -85 \end{bmatrix}$

- ☐ B. This matrix operation is not possible.

7. Solve the matrix equation $A + X = B$ for X . Let

$$A = \begin{bmatrix} 4 & 3 & -8 \\ 7 & -9 & 8 \end{bmatrix} \text{ and } B = \begin{bmatrix} -6 & 7 & 0 \\ 2 & 3 & 8 \end{bmatrix}.$$

$X = \begin{bmatrix} -10 & 4 & 8 \\ -5 & 12 & 0 \end{bmatrix}$ (Type an integer or simplified fraction for each matrix element.)

8. Solve the matrix equation $2X - A = B$ for X . Let

$$A = \begin{bmatrix} 8 & 5 & -4 \\ 4 & -5 & 9 \end{bmatrix} \text{ and } B = \begin{bmatrix} -3 & 5 & 0 \\ 8 & 6 & 3 \end{bmatrix}.$$

$$X = \begin{bmatrix} \frac{5}{2} & 5 & -2 \\ 6 & \frac{1}{2} & 6 \end{bmatrix} \quad (\text{Type an integer or simplified fraction for each matrix element.})$$

9. Find (if possible) **a.** AB and **b.** BA

$$A = \begin{bmatrix} 7 & -4 \\ 7 & -4 \end{bmatrix}, \quad B = \begin{bmatrix} 7 & 9 \\ -7 & -3 \end{bmatrix}$$

- a.** Select the correct choice below and, if necessary, fill in the answer boxes to complete your choice.

☒ **A.** $AB = \begin{bmatrix} 77 & 75 \\ 77 & 75 \end{bmatrix}$ (Simplify your answers.)

- ☐ **B.** This matrix operation is not possible.

- b.** Select the correct choice below and, if necessary, fill in the answer boxes to complete your choice.

☒ **A.** $BA = \begin{bmatrix} 112 & -64 \\ -70 & 40 \end{bmatrix}$ (Simplify your answers.)

- ☐ **B.** This matrix operation is not possible.

10. Find the product if possible.

a. AB

b. BA

$$A = \begin{bmatrix} -7 & 4 & 5 \end{bmatrix}, \quad B = \begin{bmatrix} -5 \\ -5 \\ -6 \end{bmatrix}$$

- a.** Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

☒ **A.** $AB = \begin{bmatrix} -15 \end{bmatrix}$
(Type an integer or simplified fraction for each matrix element.)

- ☐ **B.** The matrix product is not defined.

- b.** Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

☒ **A.** $BA = \begin{bmatrix} 35 & -20 & -25 \\ 35 & -20 & -25 \\ 42 & -24 & -30 \end{bmatrix}$
(Type an integer or simplified fraction for each matrix element.)

- ☐ **B.** The matrix product is not defined.

11. A company is building an apartment complex. The cost of purchasing and transporting specific amounts of steel, glass, and wood (in appropriate units) from two different locations is given by the matrices to the right. Find the matrix representing the total cost of material and transportation for steel, glass, and wood from both locations.

Steel
Glass
Wood

$$A = \begin{bmatrix} 5 & 2 & 19 \\ 5 & 1 & 4 \end{bmatrix}$$

Cost of Material
Transportation Cost

$$B = \begin{bmatrix} 8 & 3 & 20 \\ 3 & 1 & 3 \end{bmatrix}$$

Cost of Material
Transportation Cost

What is the matrix representing the total cost of material and transportation from both locations?

Steel
Glass
Wood

13
8

5
2

39
7

Cost of Material
Transportation Cost

12. Someone plans to buy 100 shares of computer stock, 300 shares of oil stock, and 500 shares of automobile stock. The computer stock is selling for 62 dollars a share, oil stock is selling for 36 dollars a share, and automobile stock is selling for 16 dollars a share. Use matrix multiplication to calculate the total cost of the purchases.

The total cost of the purchases is \$.

13. A large corporation pays its top executives a salary, a cash bonus, and shares of its stock annually. In 2005, the chairman of the board received 2.3 million dollars in salary, a 1.6 million dollar bonus, and 30,000 shares of stock; the president of the company received one-half of the compensation of the chairman; and each of the four vice presidents was paid 100,000 dollars in salary, a 160,000 dollar bonus, and 4000 shares of stock. Complete parts a through c below.

a. Express payments to these executives in salary, bonus, and stock as a 3 × 3 matrix, where the salary and bonus are in dollars and stock is in number of shares.

Chairman
President
Vice president

2300000
1600000
30000

1150000
800000
15000

100000
160000
4000

Salary
Bonus
Stock

b. Express the number of executives of each rank as a column matrix.

1
1
4

Chairman
President
Vice president

c. Use matrix multiplication to compute the total amount the company paid to each executive in each category in 2005.

3850000
3040000
61000

Total salary
Total bonuses
Total stocks

14. Given the following matrices, state whether, in general, $(A + B)^2 \neq A^2 + 2AB + B^2$ is true or false.

$$A = \begin{bmatrix} 3 & 5 \\ 4 & 1 \end{bmatrix} \quad B = \begin{bmatrix} -4 & 0 \\ 5 & -2 \end{bmatrix}$$

Find $(A + B)^2$. Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

☒ A. $(A + B)^2 = \begin{bmatrix} 46 & -10 \\ -18 & 46 \end{bmatrix}$

☐ B. This matrix operation is not possible.

Find A^2 . Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

☒ A. $A^2 = \begin{bmatrix} 29 & 20 \\ 16 & 21 \end{bmatrix}$

☐ B. This matrix operation is not possible.

Find $2AB$. Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

☒ A. $2AB = \begin{bmatrix} 26 & -20 \\ -22 & -4 \end{bmatrix}$

☐ B. This matrix operation is not possible.

Find B^2 . Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

☒ A. $B^2 = \begin{bmatrix} 16 & 0 \\ -30 & 4 \end{bmatrix}$

☐ B. This matrix operation is not possible.

Find $A^2 + 2AB + B^2$. Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

☒ A. $A^2 + 2AB + B^2 = \begin{bmatrix} 71 & 0 \\ -36 & 21 \end{bmatrix}$

☐ B. This matrix operation is not possible.

Is $(A + B)^2 \neq A^2 + 2AB + B^2$ a true statement?

- ☐ No
☒ Yes

15. Let $A = \begin{bmatrix} 0 & -10 \\ 0 & 0 \end{bmatrix}$, $B = \begin{bmatrix} -10 & 0 \\ 0 & 0 \end{bmatrix}$. Check whether $AB = BA$ or not.

Find AB . Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

☒ A. $AB = \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$ (Simplify your answers.)

☐ B. The matrix operation is not defined.

Find BA . Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

☐ A. The matrix operation is not defined.
☒ B. $BA = \begin{bmatrix} 0 & 100 \\ 0 & 0 \end{bmatrix}$ (Simplify your answers.)

Is $AB = BA$?

- ☒ No
☐ Yes

16. Watch the video and then solve the problem given below.

[Click here to watch the video.](#)¹

Find the product BA where $A = \begin{bmatrix} 6 & 1 \\ 2 & -5 \end{bmatrix}$ and $B = \begin{bmatrix} -3 & 2 \\ 5 & -1 \end{bmatrix}$.

$$BA = \begin{bmatrix} -14 & -13 \\ 28 & 10 \end{bmatrix}$$

1: <http://mediaplayer.pearsoncmg.com/assets/ABU3gGVhcCSdWF9vsgOc8QGyjdRI4DjJ?clip=1>
