Review Exercise Set 21

Exercise 1: Find the values of the variables that will make the matrices equal.

$$\begin{bmatrix} \frac{x}{2} & 3y \\ -z+3 & 4 \end{bmatrix} = \begin{bmatrix} \frac{1}{4} & -9 \\ 6 & 4 \end{bmatrix}$$

Exercise 2: Find A - 2B using the given matrices.

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

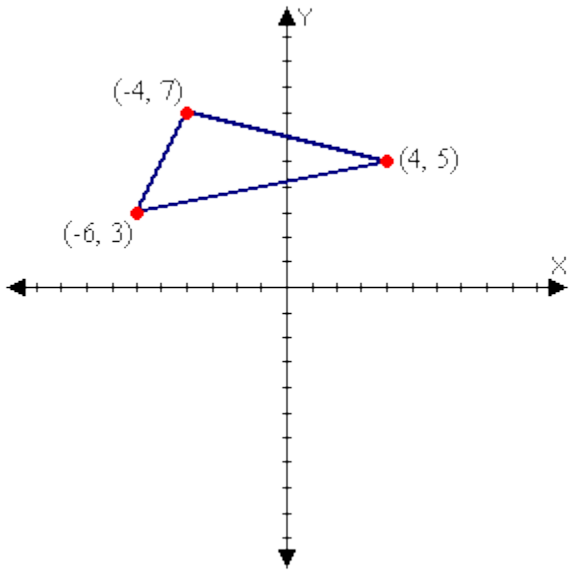
Exercise 3: Find AB for the given matrices (if possible).

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

Exercise 4: Find AB - AC for the given matrices.

$$A=\begin{bmatrix} -1 & 1 \\ 4 & 5 \\ 2 & -3 \end{bmatrix},\ B=\begin{bmatrix} 2 & -1 \\ 1 & -2 \end{bmatrix}, \text{ and } C=\begin{bmatrix} -1 & 4 \\ -2 & 1 \end{bmatrix}$$

Exercise 5: The graph below shows a triangle with its vertices labeled. First, setup a matrix that can represent the triangle if the first row contains the x coordinates and the second row contains the y coordinates. Then, use matrix operations to determine the coordinates of the vertices if the triangle is moved 4 units to the right and 3 units down.



Review Exercise Set 21 Answer Key

Exercise 1: Find the values of the variables that will make the matrices equal.

$$\begin{bmatrix} \frac{x}{2} & 3y \\ -z+3 & 4 \end{bmatrix} = \begin{bmatrix} \frac{1}{4} & -9 \\ 6 & 4 \end{bmatrix}$$

Setup the first equation between the elements in the first column of the first row in both matrices. Solve for x.

$$\frac{x}{2} = \frac{1}{4}$$
$$4x = 2$$
$$x = \frac{1}{2}$$

Setup the next equation between the elements in the second column of the first row in both matrices. Solve for y.

3y = -9
y = -3

Setup the last equation between the elements in the first column of the second row in both matrices. Solve for z.

-z + 3 = 6
-z = 3
z = -3

Exercise 2: Find A - 2B using the given matrices.

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

Find 2B

$$2B = 2\begin{bmatrix} 2 & -1 \\ 1 & 1 \\ -1 & 6 \end{bmatrix}$$

Exercise 2 (Continued):

$$2B = \begin{bmatrix} 2(2) & 2(-1) \\ 2(1) & 2(1) \\ 2(-1) & 2(6) \end{bmatrix}$$
$$= \begin{bmatrix} 4 & -2 \\ 2 & 2 \\ -2 & 12 \end{bmatrix}$$

Find A - 2B

$$A - 2B = \begin{bmatrix} -1 & 1 \\ 4 & 5 \\ 2 & -3 \end{bmatrix} - \begin{bmatrix} 4 & -2 \\ 2 & 2 \\ -2 & 12 \end{bmatrix}$$
$$= \begin{bmatrix} (-1-4) & (1-(-2)) \\ (4-2) & (5-2) \\ (-2-(-2)) & (-3-12) \end{bmatrix}$$
$$= \begin{bmatrix} -5 & 3 \\ 2 & 3 \\ 4 & -15 \end{bmatrix}$$

Exercise 3: Find AB for the given matrices (if possible).

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

$$AB = \begin{bmatrix} -5 & -3 \\ 0 & 2 \\ 3 & 5 \end{bmatrix} \begin{bmatrix} 2 & -1 & 4 \\ 1 & -2 & 1 \end{bmatrix}$$
$$= \begin{bmatrix} (-5)(2)+(-3)(1) & (-5)(-1)+(-3)(-2) & (-5)(4)+(-3)(1) \\ (0)(2)+(2)(1) & (0)(-1)+(2)(-2) & (0)(4)+(2)(1) \\ (3)(2)+(5)(1) & (3)(-1)+(5)(-2) & (3)(4)+(5)(1) \end{bmatrix}$$
$$= \begin{bmatrix} (-10-3) & (5+6) & (-20-3) \\ (0+2) & (0-4) & (0+2) \\ (6+5) & (-3-10) & (12+5) \end{bmatrix}$$

Exercise 3 (Continued):

$$AB = \begin{bmatrix} -13 & 11 & -23 \\ 2 & -4 & 2 \\ 11 & -13 & 17 \end{bmatrix}$$

Exercise 4: Find AB - AC for the given matrices.

$$A = \begin{bmatrix} -1 & 1 \\ 4 & 5 \\ 2 & -3 \end{bmatrix},\ B = \begin{bmatrix} 2 & -1 \\ 1 & -2 \end{bmatrix}, \text{ and } C = \begin{bmatrix} -1 & 4 \\ -2 & 1 \end{bmatrix}$$

Find AB

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

$$= \begin{bmatrix} (-1)(2)+(1)(1) & (-1)(-1)+(1)(-2) \\ (4)(2)+(5)(1) & (4)(-1)+(5)(-2) \\ (2)(2)+(-3)(1) & (2)(-1)+(-3)(-2) \end{bmatrix}$$

$$= \begin{bmatrix} (-2+1) & (1-2) \\ (8+5) & (-4-10) \\ (4-3) & (-2+6) \end{bmatrix}$$

$$= \begin{bmatrix} -1 & -1 \\ 13 & -14 \\ 1 & 4 \end{bmatrix}$$

Find AC

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

$$= \begin{bmatrix} (-1)(-1)+(1)(-2) & (-1)(4)+(1)(1) \\ (4)(-1)+(5)(-2) & (4)(4)+(5)(1) \\ (2)(-1)+(-3)(-2) & (2)(4)+(-3)(1) \end{bmatrix}$$

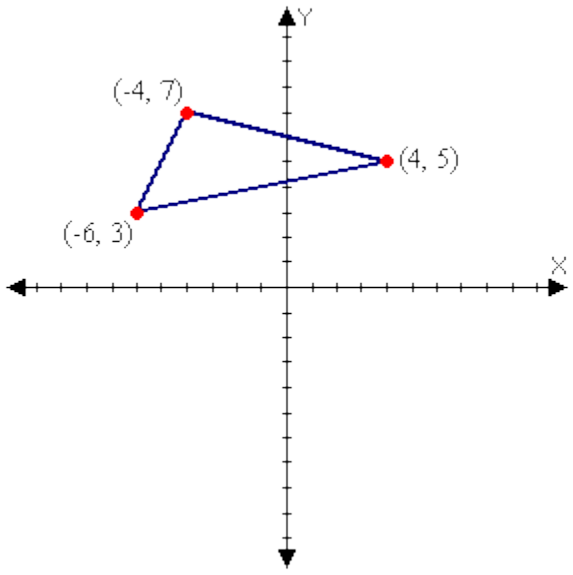
Exercise 4 (Continued):

$$AC = \begin{bmatrix} (1-2) & (-4+1) \\ (-4-10) & (16+5) \\ (-2+6) & (8-3) \end{bmatrix}$$
$$= \begin{bmatrix} -1 & -3 \\ -14 & 21 \\ 4 & 5 \end{bmatrix}$$

Find AB - AC

$$AB - AC = \begin{bmatrix} -1 & -1 \\ 13 & -14 \\ 1 & 4 \end{bmatrix} - \begin{bmatrix} -1 & -3 \\ -14 & 21 \\ 4 & 5 \end{bmatrix}$$
$$= \begin{bmatrix} (-1-(-1)) & (-1-(-3)) \\ (13-(-14)) & (-14-21) \\ (1-4) & (4-5) \end{bmatrix}$$
$$= \begin{bmatrix} 0 & 2 \\ 27 & -35 \\ -3 & -1 \end{bmatrix}$$

Exercise 5: The graph below shows a triangle with its vertices labeled. First, setup a matrix that can represent the triangle if the first row contains the x coordinates and the second row contains the y coordinates. Then, use matrix operations to determine the coordinates of the vertices if the triangle is moved 4 units to the right and 3 units down.



Exercise 5 (Continued):

Setup the matrix for the vertices

$$A=\begin{bmatrix}-6 & -4 & 4\\ 3 & 7 & 5\end{bmatrix}$$

Setup the matrix to represent the transformations

Since the first row contains the x-coordinates, the horizontal shift (4) will be placed in the first row and the vertical shift (-3) will be in the second row.

$$B=\begin{bmatrix}4 & 4 & 4\\ -3 & -3 & -3\end{bmatrix}$$

Now add the two matrices

$$\begin{aligned}A+B&=\begin{bmatrix}-6 & -4 & 4\\ 3 & 7 & 5\end{bmatrix}+\begin{bmatrix}4 & 4 & 4\\ -3 & -3 & -3\end{bmatrix}\\ &=\begin{bmatrix}(-6+4) & (-4+4) & (4+4)\\ (3+(-3)) & (7+(-3)) & (5+(-3))\end{bmatrix}\\ &=\begin{bmatrix}-2 & 0 & 8\\ 0 & 4 & 2\end{bmatrix}\end{aligned}$$

The vertices of the triangle after being shifted would be:

(-2, 0) , (0, 4) , and (8, 2)