

1.

$$\begin{aligned} 2A &= 2 * \text{Matrix A} \\ &= 2 * \begin{bmatrix} 1 & 2 & -3 \\ -5 & 4 & 2 \end{bmatrix} \\ &= \begin{bmatrix} 2 & 4 & -6 \\ -10 & 8 & 4 \end{bmatrix} \end{aligned}$$

$$\begin{aligned} 5B &= 5 * \text{Matrix B} \\ &= 5 * \begin{bmatrix} -2 & 6 & 4 \\ -1 & -2 & 3 \end{bmatrix} \\ &= \begin{bmatrix} -10 & 30 & 20 \\ -5 & -10 & 15 \end{bmatrix} \end{aligned}$$

$$\begin{aligned} 2A + 5B &= \begin{bmatrix} 2 & 4 & -6 \\ -10 & 8 & 4 \end{bmatrix} + \begin{bmatrix} -10 & 30 & 20 \\ -5 & -10 & 15 \end{bmatrix} \\ &= \begin{bmatrix} (2 + -10) & (4 + 30) & (-6 + 20) \\ (-10 + -5) & (8 + -10) & (4 + 15) \end{bmatrix} \\ &= \begin{bmatrix} -8 & 34 & 14 \\ -15 & -2 & 19 \end{bmatrix} \end{aligned}$$

Therefore, $2A + 5B$ is equal to the matrix:

$$\begin{bmatrix} -8 & 34 & 14 \\ -15 & -2 & 19 \end{bmatrix}$$

2.

$$\begin{aligned} 3A &= 3 * \text{Matrix A} \\ &= 3 * \begin{bmatrix} -3 & 1 \\ -2 & 4 \\ 5 & -1 \end{bmatrix} \\ &= \begin{bmatrix} -9 & 3 \\ -6 & 12 \\ 15 & -3 \end{bmatrix} \end{aligned}$$

$$\begin{aligned} 2B &= 2 * \text{Matrix B} \\ &= 2 * \begin{bmatrix} 4 & -2 \\ 0 & -2 \\ -2 & 4 \end{bmatrix} \\ &= \begin{bmatrix} 8 & -4 \\ 0 & -4 \\ -4 & 8 \end{bmatrix} \end{aligned}$$

$$\begin{aligned} 3A - 2B &= \begin{bmatrix} -9 & 3 \\ -6 & 12 \\ 15 & -3 \end{bmatrix} - \begin{bmatrix} 8 & -4 \\ 0 & -4 \\ -4 & 8 \end{bmatrix} \\ &= \begin{bmatrix} (-9 - 8) & (3 - -4) \\ (-6 - 0) & (12 - -4) \\ (15 - -4) & (-3 - 8) \end{bmatrix} \\ &= \begin{bmatrix} -17 & 7 \\ -6 & 16 \\ 19 & -11 \end{bmatrix} \end{aligned}$$

Therefore, $3A - 2B$ is equal to the matrix:

$$\begin{bmatrix} -17 & 7 \\ -6 & 16 \\ 19 & -11 \end{bmatrix}$$

3.

Matrix A = [

3 -2 5

0 -1 6

-4 2 -1

]

Matrix B = [

2 -1 0

3 -5 2

1 4 -2

]

BA = [

$(2 \cdot 3 + -1 \cdot 0 + 0 \cdot -4) (2 \cdot -2 + -1 \cdot -1 + 0 \cdot 2) (2 \cdot 5 + -1 \cdot 6 + 0 \cdot -1)$

$(3 \cdot 3 + -5 \cdot 0 + 2 \cdot -4) (3 \cdot -2 + -5 \cdot -1 + 2 \cdot 2) (3 \cdot 5 + -5 \cdot 6 + 2 \cdot -1)$

$(1 \cdot 3 + 4 \cdot 0 + -2 \cdot -4) (1 \cdot -2 + 4 \cdot -1 + -2 \cdot 2) (1 \cdot 5 + 4 \cdot 6 + -2 \cdot -1)$

]

Therefore, BA is equal to the matrix:

BA = [

6 3 7

13 -19

17 -6 29

]

4.

Matrix A = [

1 -2

4 -3

]

Matrix B = [

-14

6 -2

]

First, let's calculate the transpose of Matrix A:

A^T = Transpose of Matrix A

= [

14

-2 -3

]

Now, let's calculate the transpose of Matrix B:

B^T = Transpose of Matrix B

= [

-16

4 -2

]

Therefore, $3A^T - 2B^T$ is equal to the matrix:

[

5 0

-14 -5

]

$$3A^T - 2B^T = 3 * A^T - 2 * B^T$$

$$= 3 * [$$

$$14$$

$$-2 -3$$

$$] - 2 * [$$

$$-16$$

$$4 -2$$

$$]$$

$$= [$$

$$3 \ 12$$

$$-6 -9$$

$$] - [$$

$$-2 \ 12$$

$$8 -4$$

$$]$$

$$= [$$

$$(3 - -2) (12 - 12)$$

$$(-6 - 8) (-9 - -4)$$

$$]$$

$$= [$$

$$5 \ 0$$

$$-14 -5$$

$$]$$