

All Matrix Operations

Simplify. Write "undefined" for expressions that are undefined.

$$1) \begin{bmatrix} 2 & -1 \\ -6 & 1 \end{bmatrix} \cdot \begin{bmatrix} 4 & 4 \\ -3 & -5 \end{bmatrix}$$

$$2) \begin{bmatrix} 2 & 6 \\ -6 & 4 \end{bmatrix} \cdot \left(\begin{bmatrix} 5 & 3 \\ -6 & 2 \end{bmatrix} + \begin{bmatrix} 1 & 2 \\ 2 & 0 \end{bmatrix} \right)$$

$$3) \begin{bmatrix} -1 & 5 \\ 5 & -5 \end{bmatrix} \cdot \begin{bmatrix} -3 & 6 \\ -3 & 0 \end{bmatrix}$$

$$4) \begin{bmatrix} 1 & -6 \\ 3 & 5 \end{bmatrix} \cdot \begin{bmatrix} 1 \\ 5 \end{bmatrix} + \begin{bmatrix} -3 \\ 0 \\ 3 \\ -2 \end{bmatrix}$$

$$5) \begin{bmatrix} -2 \\ -3 \\ -6 \\ 2 \end{bmatrix} + \begin{bmatrix} -4 \\ 6 \\ 0 \\ -3 \end{bmatrix}$$

$$6) -4 \cdot \left(\begin{bmatrix} -3 & -6 \\ 1 & 4 \end{bmatrix} \cdot \begin{bmatrix} -2 & 6 \\ -1 & -4 \end{bmatrix} \right)$$

$$7) \begin{bmatrix} 3 & 1 & 3 \\ 0 & 5 & -3 \end{bmatrix} + \begin{bmatrix} -1 & 3 \\ 6 & 1 \end{bmatrix} \cdot \begin{bmatrix} 0 & -6 & -1 \\ 1 & 1 & 4 \end{bmatrix}$$

$$8) -5 \left(\begin{bmatrix} 2 \\ -1 \\ -6 \end{bmatrix} + \begin{bmatrix} 2 \\ -4 \\ 4 \end{bmatrix} \right)$$

$$9) \begin{bmatrix} -1 & -1 \\ -6 & 3 \end{bmatrix} + \begin{bmatrix} -5 & -1 \\ -4 & 2 \end{bmatrix} \cdot \begin{bmatrix} 3 & 6 \\ 1 & 6 \end{bmatrix}$$

$$10) \begin{bmatrix} -2 \\ -6 \end{bmatrix} - 3 \begin{bmatrix} -6 \\ 0 \end{bmatrix}$$

$$11) -2 \begin{bmatrix} -3 & -5 & -5 \\ 0 & 5 & -6 \end{bmatrix} + \begin{bmatrix} 4 & -1 & -3 \\ 6 & 3 & 2 \end{bmatrix}$$

$$12) \begin{bmatrix} -5 & 1 \\ -4 & -5 \end{bmatrix} \cdot \left(\begin{bmatrix} 5 & -4 & 2 \\ -6 & 3 & -6 \end{bmatrix} + \begin{bmatrix} 3 & -5 & 2 \\ 5 & 5 & 3 \end{bmatrix} \right)$$

$$13) \left(\begin{bmatrix} -4y & 2y \\ 2 & 3 \end{bmatrix} + \begin{bmatrix} 2y & 6 \\ 2 & 2x \end{bmatrix} \right) \cdot \begin{bmatrix} 5 \\ -5 \end{bmatrix}$$

$$14) \begin{bmatrix} 6y & y^2 \\ -2y & -2y \end{bmatrix} \cdot \begin{bmatrix} -y & xy \\ -6 & x^2 \end{bmatrix} - \begin{bmatrix} 6y & -6 \\ -3y & y \end{bmatrix}$$

Critical thinking questions:

15) Give an example of a matrix expression in which you would first perform a matrix subtraction and then a matrix multiplication. Use any numbers and dimensions you would like but be sure that your expression isn't undefined.

16) A , B , and C are matrices: $A(B + C) = AB + CA$
 A) Always true B) Sometimes true
 C) False

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Simplify. Write "undefined" for expressions that are undefined.

$$1) \begin{bmatrix} 2 & -1 \\ -6 & 1 \end{bmatrix} \cdot \begin{bmatrix} 4 & 4 \\ -3 & -5 \end{bmatrix}$$

$$\begin{bmatrix} 11 & 13 \\ -27 & -29 \end{bmatrix}$$

$$2) \begin{bmatrix} 2 & 6 \\ -6 & 4 \end{bmatrix} \cdot \left(\begin{bmatrix} 5 & 3 \\ -6 & 2 \end{bmatrix} + \begin{bmatrix} 1 & 2 \\ 2 & 0 \end{bmatrix} \right)$$

$$\begin{bmatrix} -12 & 22 \\ -52 & -22 \end{bmatrix}$$

$$3) \begin{bmatrix} -1 & 5 \\ 5 & -5 \end{bmatrix} \cdot \begin{bmatrix} -3 & 6 \\ -3 & 0 \end{bmatrix}$$

$$\begin{bmatrix} -12 & -6 \\ 0 & 30 \end{bmatrix}$$

$$4) \begin{bmatrix} 1 & -6 \\ 3 & 5 \end{bmatrix} \cdot \begin{bmatrix} 1 \\ 5 \end{bmatrix} + \begin{bmatrix} -3 \\ 0 \\ 3 \\ -2 \end{bmatrix}$$

Undefined

$$5) \begin{bmatrix} -2 \\ -3 \\ -6 \\ 2 \end{bmatrix} + \begin{bmatrix} -4 \\ 6 \\ 0 \\ -3 \end{bmatrix}$$

$$\begin{bmatrix} -6 \\ 3 \\ -6 \\ -1 \end{bmatrix}$$

$$6) -4 \cdot \left(\begin{bmatrix} -3 & -6 \\ 1 & 4 \end{bmatrix} \cdot \begin{bmatrix} -2 & 6 \\ -1 & -4 \end{bmatrix} \right)$$

$$\begin{bmatrix} -48 & -24 \\ 24 & 40 \end{bmatrix}$$

$$7) \begin{bmatrix} 3 & 1 & 3 \\ 0 & 5 & -3 \end{bmatrix} + \begin{bmatrix} -1 & 3 \\ 6 & 1 \end{bmatrix} \cdot \begin{bmatrix} 0 & -6 & -1 \\ 1 & 1 & 4 \end{bmatrix}$$

$$\begin{bmatrix} 6 & 10 & 16 \\ 1 & -30 & -5 \end{bmatrix}$$

$$8) -5 \left(\begin{bmatrix} 2 \\ -1 \\ -6 \end{bmatrix} + \begin{bmatrix} 2 \\ -4 \\ 4 \end{bmatrix} \right)$$

$$\begin{bmatrix} -20 \\ 25 \\ 10 \end{bmatrix}$$

$$9) \begin{bmatrix} -1 & -1 \\ -6 & 3 \end{bmatrix} + \begin{bmatrix} -5 & -1 \\ -4 & 2 \end{bmatrix} \cdot \begin{bmatrix} 3 & 6 \\ 1 & 6 \end{bmatrix}$$

$$\begin{bmatrix} -17 & -37 \\ -16 & -9 \end{bmatrix}$$

$$10) \begin{bmatrix} -2 \\ -6 \end{bmatrix} - 3 \begin{bmatrix} -6 \\ 0 \end{bmatrix}$$

$$\begin{bmatrix} 16 \\ -6 \end{bmatrix}$$

$$11) -2 \begin{bmatrix} -3 & -5 & -5 \\ 0 & 5 & -6 \end{bmatrix} + \begin{bmatrix} 4 & -1 & -3 \\ 6 & 3 & 2 \end{bmatrix}$$

$$\begin{bmatrix} 10 & 9 & 7 \\ 6 & -7 & 14 \end{bmatrix}$$

$$12) \begin{bmatrix} -5 & 1 \\ -4 & -5 \end{bmatrix} \cdot \left(\begin{bmatrix} 5 & -4 & 2 \\ -6 & 3 & -6 \end{bmatrix} + \begin{bmatrix} 3 & -5 & 2 \\ 5 & 5 & 3 \end{bmatrix} \right)$$

$$\begin{bmatrix} -41 & 53 & -23 \\ -27 & -4 & -1 \end{bmatrix}$$

$$13) \left(\begin{bmatrix} -4y & 2y \\ 2 & 3 \end{bmatrix} + \begin{bmatrix} 2y & 6 \\ 2 & 2x \end{bmatrix} \right) \cdot \begin{bmatrix} 5 \\ -5 \end{bmatrix}$$

$$\begin{bmatrix} -20y - 30 \\ 5 - 10x \end{bmatrix}$$

$$14) \begin{bmatrix} 6y & y^2 \\ -2y & -2y \end{bmatrix} \cdot \begin{bmatrix} -y & xy \\ -6 & x^2 \end{bmatrix} - \begin{bmatrix} 6y & -6 \\ -3y & y \end{bmatrix}$$

$$\begin{bmatrix} -12y^2 - 6y & 6y^2x + y^2x^2 + 6 \\ 2y^2 + 15y & -2y^2x - 2yx^2 - y \end{bmatrix}$$

Critical thinking questions:

15) Give an example of a matrix expression in which you would first perform a matrix subtraction and then a matrix multiplication. Use any numbers and dimensions you would like but be sure that your expression isn't undefined.

16) A , B , and C are matrices: $A(B + C) = AB + CA$
 A) Always true *B) Sometimes true
 C) False

Many answers. Ex: $\begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix} \cdot \left(\begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix} - \begin{bmatrix} a & b \\ c & d \end{bmatrix} \right)$