

Linear Algebra: show what you know! (Sep 10th)

*This perfectly optional quiz is **open-calculator**.*

Name: _____

1. What is the result of the following operations? If an operation is impossible or undefined, simply write “*u cant do dat*” instead of giving a mathematical answer.

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

The first matrix is 3×2 , while the second is 2×3 , so their dimensions do not match.

u cant do dat

(b) $\begin{bmatrix} 4 & 2 \\ 3 & -1 \\ 0 & 2 \end{bmatrix} + \begin{bmatrix} 0 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix}^T$

$$\begin{bmatrix} 0 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix}^T = \begin{bmatrix} 0 & 4 \\ 2 & 5 \\ 3 & 6 \end{bmatrix}$$

$$\begin{bmatrix} 4 & 6 \\ 5 & 4 \\ 3 & 8 \end{bmatrix}$$

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

$$\begin{aligned} (4)(0) + (2)(4) &= 8, & (4)(2) + (2)(5) &= 18, & (4)(3) + (2)(6) &= 24, \\ (3)(0) + (-1)(4) &= -4, & (3)(2) + (-1)(5) &= 1, & (3)(3) + (-1)(6) &= 3, \\ (0)(0) + (2)(4) &= 8, & (0)(2) + (2)(5) &= 10, & (0)(3) + (2)(6) &= 12. \end{aligned}$$

$$\begin{bmatrix} 8 & 18 & 24 \\ -4 & 1 & 3 \\ 8 & 10 & 12 \end{bmatrix}$$

(d) $\begin{bmatrix} 4 & 2 \\ 3 & -1 \\ 0 & 2 \end{bmatrix} \cdot \begin{bmatrix} 0 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix}^T$

After transposing, the second matrix is 3×2 , so this would be $(3 \times 2)(3 \times 2)$; the inner dimensions do not match.

u cant do dat

(e) $\|\vec{\mathbf{x}}\|$, where $\vec{\mathbf{x}} = \begin{bmatrix} 3 & -4 \end{bmatrix}$ (use the Euclidean norm)

$$\sqrt{\mathbf{3}^2 + (-4)^2} = \sqrt{\mathbf{9} + \mathbf{16}} = \sqrt{\mathbf{25}} = \mathbf{5}$$

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(f) $\|\vec{\mathbf{y}}\|$, where $\vec{\mathbf{y}} = \begin{bmatrix} -2 \\ 5 \end{bmatrix}$ (use the Manhattan/taxicab norm)

$$|-2| + |5| = 2 + 5 = 7$$

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