Linear Algebra

TOTAL POINTS 5

1. Let two matrices be **1 / 1 point**

$$A = \begin{bmatrix} 4 & 3 \\ 6 & 9 \end{bmatrix}, \qquad B = \begin{bmatrix} -2 & 9 \\ -5 & 2 \end{bmatrix}$$

What is A + B?

- $\begin{bmatrix} 2 & 9 \\ 1 & 2 \end{bmatrix}$
- $\begin{bmatrix} 6 & 12 \\ 11 & 11 \end{bmatrix}$
- $\begin{bmatrix} 6 & -6 \\ 11 & 7 \end{bmatrix}$
- ◉ $\begin{bmatrix} 2 & 12 \\ 1 & 11 \end{bmatrix}$

✓ **Correct**
To add two matrices, add them element-wise.

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2. Let $x = \begin{bmatrix} 5 \\ 5 \\ 2 \\ 7 \end{bmatrix}$ **1 / 1 point**

What is $2 * x$?

- ◉ $\begin{bmatrix} 10 \\ 10 \\ 4 \\ 14 \end{bmatrix}$
- $\begin{bmatrix} 10 & 10 & 4 & 14 \end{bmatrix}$
- $\begin{bmatrix} \frac{5}{2} \\ \frac{5}{2} \\ 1 \\ \frac{7}{2} \end{bmatrix}$
- $\begin{bmatrix} \frac{5}{2} & \frac{5}{2} & 1 & \frac{7}{2} \end{bmatrix}$

✓ **Correct**
To multiply the vector x by 2, take each element of x and multiply that element by 2.

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3. Let u be a 3-dimensional vector, where specifically **1 / 1 point**

$$u = \begin{bmatrix} 3 \\ 5 \\ 1 \end{bmatrix}$$

What is u^T?

- $\begin{bmatrix} 1 & 5 & 3 \end{bmatrix}$
- $\begin{bmatrix} 3 \\ 5 \\ 1 \end{bmatrix}$
- $\begin{bmatrix} 1 \\ 5 \\ 3 \end{bmatrix}$
- ◉ $\begin{bmatrix} 3 & 5 & 1 \end{bmatrix}$

✓ **Correct**

4. Let u and v be 3-dimensional vectors, where specifically

1 / 1 point

$$u = \begin{bmatrix} 3 \\ -5 \\ 4 \end{bmatrix}$$

and

$$v = \begin{bmatrix} 1 \\ 2 \\ 5 \end{bmatrix}$$

What is $u^T v$?

(Hint: u^T is a 1x3 dimensional matrix, and v can also be seen as a 3x1 matrix. The answer you want can be obtained by taking the matrix product of u^T and v.) Do not add brackets to your answer.

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5. Let A and B be 3x3 (square) matrices. Which of the following must necessarily hold true? Check all that apply.

1 / 1 point

- [x] $A + B = B + A$

✓ Correct
We add matrices element-wise. So, this must be true.

- [ ] If $C = A * B$, then C is a 6x6 matrix.
- [x] If v is a 3 dimensional vector, then $A * B * v$ is a 3 dimensional vector.

✓ Correct
Since A and B are both 3x3 matrices, $A * B$ is 3x3 matrix. Thus, $(A * B) * v$ is a 3x3 matrix times a 3×1 matrix (since v is a 3 dimensional vector, and thus also a 3x1 matrix), and the result gives a 3x1 vector.

- [ ] $A * B * A = B * A * B$