WEEK 1 QUIZ 3

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?

- (●) $\begin{bmatrix} 6 & -6 \\ 11 & 7 \end{bmatrix}$
- ( ) $\begin{bmatrix} 2 & -6 \\ 1 & 7 \end{bmatrix}$
- ( ) $\begin{bmatrix} 4 & 12 \\ 1 & 11 \end{bmatrix}$
- ( ) $\begin{bmatrix} 6 & -12 \\ 11 & 11 \end{bmatrix}$

✓ **Correct**

To subtract B from A, carry out the subtraction element-wise.

2. 1 / 1 point

Let $x = \begin{bmatrix} 5 \\ 5 \\ 2 \\ 7 \end{bmatrix}$

What is $2 * x$?

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

Correct

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

3. Let u be a 3-dimensional vector, where specifically

1 / 1 point

$$u = \begin{bmatrix} 5 \\ 1 \\ 9 \end{bmatrix}$$

What is u^{T}?

- $\begin{bmatrix} 5 \\ 1 \\ 9 \end{bmatrix}$
- $\begin{bmatrix} 9 \\ 1 \\ 5 \end{bmatrix}$
- $\begin{bmatrix} 5 & 1 & 9 \end{bmatrix}$
- $\begin{bmatrix} 9 & 1 & 5 \end{bmatrix}$

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] If $C = A * B$, then C is a 3x3 matrix.

Correct

Since A and B are both 3x3 matrices, their product is 3x3. More generally, if A were an $m \times n$. matrix, and B a $n \times o$ matrix, then C would be $m \times o$. (In our example, $m = n = o = 3$.)

- [ ] $A * B = B * A$
- [ ] $A * B * A = B * A * B$
- [x] If B is the 3x3 identity matrix, then $A * B = B * A$

Correct

Even though matrix multiplication is not commutative in general ($A * B \neq B * A$ for general matrices A, B), for the special case where $B = I$, we have $A * B = A * I = A$, and also $B * A = I * A = A$. So, $A * B = B * A$.