Quiz 3 Linear Algebra

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?

- ○ $\begin{bmatrix} 4 & 12 \\ 1 & 11 \end{bmatrix}$
- ◉ $\begin{bmatrix} 6 & -6 \\ 11 & 7 \end{bmatrix}$
- ○ $\begin{bmatrix} 2 & -6 \\ 1 & 7 \end{bmatrix}$
- ○ $\begin{bmatrix} 6 & -12 \\ 11 & 11 \end{bmatrix}$

✓ **Correct**

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

2. Let $x = \begin{bmatrix} 2 \\ 7 \\ 4 \\ 1 \end{bmatrix}$

1 / 1 point

What is $\frac{1}{2} * x$?

- ○ $\begin{bmatrix} 4 & 14 & 8 & 2 \end{bmatrix}$
- ○ $\begin{bmatrix} 1 & \frac{7}{2} & 2 & \frac{1}{2} \end{bmatrix}$
- ○ $\begin{bmatrix} 4 \\ 14 \\ 8 \\ 2 \end{bmatrix}$
- ◉ $\begin{bmatrix} 1 \\ \frac{7}{2} \\ 2 \\ \frac{1}{2} \end{bmatrix}$

✓ **Correct**

To multiply the vector x by $\frac{1}{2}$, take each element of x and multiply that element by $\frac{1}{2}$.

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

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

and

$$v = \begin{bmatrix} 4 \\ 2 \\ 4 \end{bmatrix}$$

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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✓ Correct

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

1 / 1 point

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

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

- [x] If A 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 $A = I$, we have $A * B = I * B = B$, and also $B * A = B * I = B$. So, $A * B = B * A$.

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