

1. (1 point) Let  $A$  and  $B$  be the following matrices.

$$A = \begin{bmatrix} 8 & 1 & -1 \\ -2 & -2 & -7 \\ -8 & -7 & 8 \end{bmatrix}, \quad B = \begin{bmatrix} -3 & 3 & 0 \\ -1 & 0 & -2 \\ -7 & -9 & -8 \end{bmatrix}$$

Perform the following operations:

$$8A = \begin{bmatrix} \_ & \_ & \_ \\ \_ & \_ & \_ \\ \_ & \_ & \_ \end{bmatrix}$$

$$A + 10B = \begin{bmatrix} \_ & \_ & \_ \\ \_ & \_ & \_ \\ \_ & \_ & \_ \end{bmatrix}$$

$$-5A + 4B = \begin{bmatrix} \_ & \_ & \_ \\ \_ & \_ & \_ \\ \_ & \_ & \_ \end{bmatrix}$$

2. (1 point) Let

$$A = \begin{bmatrix} 1 & 1 & -1 \\ -1 & 5 & -5 \\ 2 & -1 & -5 \end{bmatrix}.$$

Compute the following.

$$A + A^T = \begin{bmatrix} \_ & \_ & \_ \\ \_ & \_ & \_ \\ \_ & \_ & \_ \end{bmatrix}$$

$$A - A^T = \begin{bmatrix} \_ & \_ & \_ \\ \_ & \_ & \_ \\ \_ & \_ & \_ \end{bmatrix}$$

3. (1 point) Compute the following products.

$$\begin{bmatrix} -7 & -1 \\ -5 & -1 \end{bmatrix} \begin{bmatrix} -4 \\ 2 \end{bmatrix} = \begin{bmatrix} \_ \\ \_ \end{bmatrix}$$

$$\begin{bmatrix} -7 & -1 \\ -5 & -1 \end{bmatrix} \begin{bmatrix} 1 \\ 5 \end{bmatrix} = \begin{bmatrix} \_ \\ \_ \end{bmatrix}$$

$$\begin{bmatrix} -7 & -1 \\ -5 & -1 \end{bmatrix} \begin{bmatrix} -4 & 1 \\ 2 & 5 \end{bmatrix} = \begin{bmatrix} \_ & \_ \\ \_ & \_ \end{bmatrix}$$

4. (1 point) Compute the following product.

$$\begin{bmatrix} -4 & 7 \\ 9 & -9 \end{bmatrix} \begin{bmatrix} -2 & -1 & -3 \\ 8 & 4 & -5 \end{bmatrix} = \begin{bmatrix} \_ & \_ & \_ \\ \_ & \_ & \_ \end{bmatrix}$$

5. (1 point) Compute the following product.

$$\begin{bmatrix} 5 & -3 & -1 \\ 9 & 9 & 5 \\ 4 & 3 & 4 \end{bmatrix} \begin{bmatrix} 1 & 0 & 0 \\ 0 & 4 & 0 \\ 0 & 0 & 0 \end{bmatrix} = \begin{bmatrix} \_ & \_ & \_ \\ \_ & \_ & \_ \\ \_ & \_ & \_ \end{bmatrix}$$

6. (1 point) Compute the following product.

$$\begin{bmatrix} -8 & 0 & 0 \\ 3 & 6 & 0 \\ -6 & 7 & -5 \end{bmatrix} \begin{bmatrix} 9 & 0 & 0 \\ -5 & -2 & 0 \\ -6 & -4 & 1 \end{bmatrix} = \begin{bmatrix} \_ & \_ & \_ \\ \_ & \_ & \_ \\ \_ & \_ & \_ \end{bmatrix}$$

7. (1 point) Compute the following product.

$$\begin{bmatrix} 1 & -3 & 1 \\ -8 & -7 & -2 \\ 2 & 4 & 5 \end{bmatrix} \begin{bmatrix} 5 & -1 & 1 \\ 5 & 9 & -1 \\ -1 & -2 & -8 \end{bmatrix} = \begin{bmatrix} \_ & \_ & \_ \\ \_ & \_ & \_ \\ \_ & \_ & \_ \end{bmatrix}$$

8. (1 point) Let  $A$  and  $B$  be the following matrices.

$$A = \begin{bmatrix} 8 & 4 \\ -3 & 6 \end{bmatrix}, \quad B = \begin{bmatrix} -5 & -9 \\ 2 & -7 \end{bmatrix}$$

Perform the following operations:

$$A \cdot B = \begin{bmatrix} \_ & \_ \\ \_ & \_ \end{bmatrix}$$

$$B \cdot A = \begin{bmatrix} \_ & \_ \\ \_ & \_ \end{bmatrix}$$

9. (1 point) Let  $A$  and  $B$  be the following matrices.

$$A = \begin{bmatrix} -5 & -9 & 4 \\ -2 & 7 & 3 \end{bmatrix}, \quad B = \begin{bmatrix} -1 & 2 \\ -5 & -5 \\ 6 & -6 \end{bmatrix}$$

Perform the following operations:

$$A \cdot B = \begin{bmatrix} \_ & \_ \\ \_ & \_ \end{bmatrix}$$

$$B \cdot A = \begin{bmatrix} \_ & \_ & \_ \\ \_ & \_ & \_ \\ \_ & \_ & \_ \end{bmatrix}$$

10. (1 point)

If  $A$  and  $B$  are  $4 \times 6$  matrices, and  $C$  is a  $7 \times 4$  matrix, which of the following are defined?

- A.  $CB$
- B.  $B - A$
- C.  $CA - B$
- D.  $A + C$
- E.  $AB$

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**11.** (1 point) Solve for  $X$ .

$$\begin{bmatrix} -2 & 6 & -6 \\ 1 & 6 & 5 \end{bmatrix} = -5X - 5 \begin{bmatrix} -5 & 4 & 7 \\ 5 & 5 & -1 \end{bmatrix}.$$

$$X = \begin{bmatrix} \rule{1.5cm}{0.4pt} & \rule{0.5cm}{0.4pt} & \rule{0.5cm}{0.4pt} \\ \rule{1.5cm}{0.4pt} & \rule{0.5cm}{0.4pt} & \rule{0.5cm}{0.4pt} \end{bmatrix}$$

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**12.** (1 point) Find a non-zero  $2 \times 2$  matrix  $A$  such that  $A^2 = \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$ . (Your answer for  $A$  needs to be nonzero, which means it can have some zeros in it but not all zeros.)

$$A = \begin{bmatrix} \rule{1cm}{0.4pt} & \rule{1cm}{0.4pt} \\ \rule{1cm}{0.4pt} & \rule{1cm}{0.4pt} \end{bmatrix}$$