

**MATH 2111 Matrix Algebra and Applications**  
**Homework-4 : Due 10/14/2022 at 11:59pm HKT**

1. (1 point) If

$$A = \begin{bmatrix} -3 & 1 & -4 & 4 \\ 3 & 3 & -4 & -2 \\ -3 & -4 & -2 & -4 \end{bmatrix},$$

determine the following entries:

$$a_{12} = \underline{\hspace{2cm}}$$

$$a_{33} = \underline{\hspace{2cm}}$$

$$a_{24} = \underline{\hspace{2cm}}$$

Correct Answers:

- 1
- -2
- -2

2. (1 point) If  $A = \begin{bmatrix} -2 & 3 & -3 \\ -1 & 4 & 2 \\ 1 & -1 & -2 \end{bmatrix}$  and  $B =$

$$\begin{bmatrix} 4 & -4 & 4 \\ -1 & -3 & 4 \\ -2 & -4 & -3 \end{bmatrix}, \text{ then}$$

$$3A - 4B = \begin{bmatrix} \underline{\hspace{1cm}} & \underline{\hspace{1cm}} & \underline{\hspace{1cm}} \\ \underline{\hspace{1cm}} & \underline{\hspace{1cm}} & \underline{\hspace{1cm}} \\ \underline{\hspace{1cm}} & \underline{\hspace{1cm}} & \underline{\hspace{1cm}} \end{bmatrix}$$

Correct Answers:

- $\begin{bmatrix} -22 & 25 & -25 \\ 1 & 24 & -10 \\ 11 & 13 & 6 \end{bmatrix}$

3. (1 point) Solve for X.

$$\begin{bmatrix} 1 & 3 \\ 5 & -7 \end{bmatrix} - 2X = \begin{bmatrix} 1 & -7 \\ -3 & 5 \end{bmatrix}.$$

$$X = \begin{bmatrix} \underline{\hspace{1cm}} & \underline{\hspace{1cm}} \\ \underline{\hspace{1cm}} & \underline{\hspace{1cm}} \end{bmatrix}$$

Correct Answers:

- $\begin{bmatrix} 0 & 5 \\ 4 & -6 \end{bmatrix}$

4. (2 points)

If A and B are  $9 \times 6$  matrices, and C is a  $3 \times 9$  matrix, which of the following are defined?

- A. CB
- B. B + A
- C. AC
- D.  $AB^T$
- E. A + C

- F.  $A^T$

Correct Answers:

- ABDF

5. (2 points)

Consider the matrices:

$$A = \begin{pmatrix} 9 & 2 & 9 \\ 8 & 2 & 5 \end{pmatrix}, B = \begin{pmatrix} 10 & 2 & 9 & 6 \\ 8 & 5 & 5 & 2 \\ 2 & 7 & 1 & 5 \end{pmatrix}, \text{ and } C = \begin{pmatrix} 3 & 3 \\ 1 & 6 \\ 3 & 2 \\ 7 & 3 \end{pmatrix}$$

Of the possible matrix products  $ABC, ACB, BAC, BCA, CAB, CBA$ , which make sense? \_\_\_\_\_

- A. ( ACB, BAC, CAB ) only
- B. ( ACB, BAC, CBA ) only
- C. ( ABC, BCA, CAB ) only
- D. all of them
- E. none of them

Correct Answers:

- C

6. (1 point)

Compute the following:

$$\begin{bmatrix} -1 & -2 \\ -1 & 1 \\ -1 & 1 \end{bmatrix} \begin{bmatrix} 2 & 2 \\ -1 & 2 \end{bmatrix} + \begin{bmatrix} 1 & 2 \\ 3 & 4 \\ 5 & 6 \end{bmatrix} = \begin{bmatrix} \underline{\hspace{1cm}} & \underline{\hspace{1cm}} \\ \underline{\hspace{1cm}} & \underline{\hspace{1cm}} \\ \underline{\hspace{1cm}} & \underline{\hspace{1cm}} \end{bmatrix}$$

Correct Answers:

- 1
- -4
- 0
- 4
- 2
- 6

7. (2 points) If

$$u = \begin{bmatrix} 7 \\ 9 \\ -6 \end{bmatrix}$$

then

$$uu^T = \begin{bmatrix} \underline{\hspace{1cm}} & \underline{\hspace{1cm}} & \underline{\hspace{1cm}} \\ \underline{\hspace{1cm}} & \underline{\hspace{1cm}} & \underline{\hspace{1cm}} \\ \underline{\hspace{1cm}} & \underline{\hspace{1cm}} & \underline{\hspace{1cm}} \end{bmatrix} \text{ and } u^T u = [ \underline{\hspace{1cm}} ].$$

Correct Answers:

- $\begin{bmatrix} 49 & 63 & -42 \\ 63 & 81 & -54 \\ -42 & -54 & 36 \end{bmatrix}$

- $\begin{bmatrix} 166 \end{bmatrix}$

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**8.** (2 points) If  $A = \begin{bmatrix} -6 & -2 & -5 \\ 6 & 6 & 2 \end{bmatrix}$  and  $B = \begin{bmatrix} -1 & -3 \\ 3 & 5 \\ -5 & 2 \end{bmatrix}$ , then

$$\begin{bmatrix} -6 & -2 & -5 \\ 6 & 6 & 2 \end{bmatrix} \begin{bmatrix} -1 & -3 \\ 3 & 5 \\ -5 & 2 \end{bmatrix} = \begin{bmatrix} \_ & \_ \\ \_ & \_ \end{bmatrix} \text{ and }$$

$$\begin{bmatrix} -1 & -3 \\ 3 & 5 \\ -5 & 2 \end{bmatrix} \begin{bmatrix} -6 & -2 & -5 \\ 6 & 6 & 2 \end{bmatrix} = \begin{bmatrix} \_ & \_ & \_ \\ \_ & \_ & \_ \\ \_ & \_ & \_ \end{bmatrix}.$$

*Correct Answers:*

- $\begin{bmatrix} 25 & -2 \\ 2 & 16 \end{bmatrix}$

- $\begin{bmatrix} -12 & -16 & -1 \\ 12 & 24 & -5 \\ 42 & 22 & 29 \end{bmatrix}$

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**9.** (1 point) Given the matrix  $A = \begin{bmatrix} -3 & 2 \\ 0 & -1 \end{bmatrix}$ , find  $A^3$ .

$$A^3 = \begin{bmatrix} \_ & \_ \\ \_ & \_ \end{bmatrix}$$

*Correct Answers:*

- $\begin{bmatrix} -27 & 26 \\ 0 & -1 \end{bmatrix}$