Math 10A Fall 2024 Worksheet 4

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1 Matrix Algebra

1. Let $A = \begin{bmatrix} 1 & 2 \\ 3 & 2 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 0 \\ 5 & -1 \end{bmatrix}$. Find $A + B$

2. Let $C = \begin{bmatrix} 1 & 3 & 5 & 8 \\ 2 & 3 & 0 & -1 \end{bmatrix}$. Find $4C$.

3. Let $D = \begin{bmatrix} 2 & -1 \\ 1 & 1 \end{bmatrix}$ and $E = \begin{bmatrix} 3 & 4 \\ 5 & 0 \end{bmatrix}$. Find $D - E$.

4. Given $F = \begin{bmatrix} 3 & 4 & 8 & 9 \\ 5 & 1 & -1 & 0 \end{bmatrix}$. Find F^T

5. Suppose $G = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$. What is G^T?

6. Let $H = \begin{bmatrix} 3 & 4 & 0 & 1 \end{bmatrix}$. What is H^T

7. Given H as in problem 6 and F as in problem 4, compute FH^T.

8. Comptue IJ where $I = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$ and $J = \begin{bmatrix} -1 & 0 \\ 1 & 3 \end{bmatrix}$.

9. Let $M = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$ and $N = \begin{bmatrix} e & f \\ g & h \end{bmatrix}$. Compute MN.

10. Let $P = \begin{bmatrix} 1 & 2 & 3 \\ 5 & 0 & -1 \end{bmatrix}$ and $Q = \begin{bmatrix} 0 & 2 \\ 5 & 2 \\ 1 & 2 \end{bmatrix}$. Which of the following is defined?

$$PQ \quad QP \quad PQ^T \quad P^TQ \quad Q^TP$$

2   Matrices and Dynamics of Vectors

1. Draw the matrix diagram for the following matrix model:

$$L = \begin{bmatrix} 0 & 3 & 5 \\ 0.5 & 1.1 & 3 \\ 1 & 0.8 & 0 \end{bmatrix}$$

Solutions

3 Matrix Algebra

1. $A + B = \begin{bmatrix} 2 & 2 \\ 8 & -1 \end{bmatrix}$.

2. $4C = \begin{bmatrix} 4 & 12 & 20 & 32 \\ 8 & 12 & 0 & -4 \end{bmatrix}$.

3. $D - E = \begin{bmatrix} -1 & -5 \\ -4 & 1 \end{bmatrix}$

4. $F^T = \begin{bmatrix} 3 & 5 \\ 4 & 1 \\ 8 & -1 \\ 9 & 0 \end{bmatrix}$

5. $G^T = \begin{bmatrix} a & c \\ b & d \end{bmatrix}$

6. $H^T = \begin{bmatrix} 3 \\ 4 \\ 0 \\ 1 \end{bmatrix}$

7. $FH^T = \begin{bmatrix} 34 \\ 19 \end{bmatrix}$

8. $IJ = \begin{bmatrix} 1 & 6 \\ 1 & 12 \end{bmatrix}$

9. $MN = \begin{bmatrix} ae + bg & af + bh \\ ce + dg & cf + dh \end{bmatrix}$

10. P is a 2×3 matrix, and Q is a 3×2 matrix. So PQ is defined; QP is defined; PQ^T is not defined; $P^T Q$ is not defined; and $Q^T P$ is not defined.

4 Matrices and Dynamics of Vectors

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