2022-2023 James E Davis Trimester 1 Algebra 2 Week 3 Class Notes

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Previously...

We over the following properties:

Additive Properties

- $A + 0_{m\times n} = A = 0_{m\times n} + A$
- $A + B = B + A$
- $A + (-1)A = 0_{m\times n} = (-1)A + A = 0_{m\times n}$
- $c(A + B) = cA + cB$
- $(c + d)A = cA + dB$

Multiplicative Poperties

- $A(BC) = (AB)C$ (refer to **Example 3** of the last section)
- We don't always have $AB = BA$ (though sometimes we do)
- $I_m A = A,\ AI_n = A$, and for square matrices, we have $AI_n = A = I_n A$

Properties of Matrices (Cont.)

Example 1. Let

$$A = \begin{bmatrix} 1 & 1 \\ 0 & 0 \end{bmatrix},\ B = \begin{bmatrix} -1 & 1 \\ 0 & -1 \end{bmatrix}$$

We find that

$$AB = \begin{bmatrix} 1 & 1 \\ 0 & 0 \end{bmatrix}\begin{bmatrix} -1 & 1 \\ 0 & -1 \end{bmatrix} = \begin{bmatrix} -1 & 0 \\ 0 & 0 \end{bmatrix}$$
$$BA = \begin{bmatrix} -1 & 1 \\ 0 & -1 \end{bmatrix}\begin{bmatrix} 1 & 1 \\ 0 & 0 \end{bmatrix} = \begin{bmatrix} (-1)(1) + (1)(0) & (-1)(1) + (1)(0) \\ (0)(1) + (1)(0) & (0)(1) + (1)(0) \end{bmatrix} = \begin{bmatrix} -1 & -1 \\ 0 & 0 \end{bmatrix}$$

and in this example we have $AB \neq BA$

Whereas, with any pair of diagonal matrices such as $\begin{bmatrix} 1 & 0 \\ 0 & 2 \end{bmatrix}$ and $\begin{bmatrix} -3 & 0 \\ 0 & 7 \end{bmatrix}$, the product is the
same regardless of order, i.e., we have

$$\begin{bmatrix} 1 & 0 \\ 0 & 2 \end{bmatrix}\begin{bmatrix} -3 & 0 \\ 0 & 7 \end{bmatrix} = \begin{bmatrix} -3 & 0 \\ 0 & 14 \end{bmatrix} = \begin{bmatrix} -3 & 0 \\ 0 & 7 \end{bmatrix}\begin{bmatrix} 1 & 0 \\ 0 & 2 \end{bmatrix}$$

This verifies the noncommutative property of matrices discussed previously.

Next Time...

We'll go more in detail on exponentiation properties of a matrix, and do order of operations of matrices (including exponentiation), and that will conclude the matrix arithmetic portion of what we're studying.

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ASVAB Testing, no class

10/5-10/7

Wellness Days