

9-4 NOTES

Sec 1 H

Multiplying Matrices Day 2

Unit 9

Ex. 1: If $A = \begin{bmatrix} 2 & 1 \\ -1 & 3 \end{bmatrix}$, $B = \begin{bmatrix} -2 & 0 \\ 4 & 2 \end{bmatrix}$, and $C = \begin{bmatrix} 1 & 1 \\ 3 & 2 \end{bmatrix}$,
simplify each expression.

a. $(AB)C$

$$\begin{array}{l} T \\ B \end{array} \begin{bmatrix} 2 & 1 \\ -1 & 3 \end{bmatrix} \cdot \begin{array}{l} L \quad R \\ \begin{bmatrix} -2 & 0 \\ 4 & 2 \end{bmatrix} \end{array}$$

$$\begin{array}{l} T \\ B \end{array} \begin{array}{l} L \quad R \\ \begin{bmatrix} -4+4 & 0+2 \\ 2+12 & 0+6 \end{bmatrix} \end{array} = \begin{array}{l} \begin{bmatrix} 0 & 2 \\ 14 & 6 \end{bmatrix} \end{array} \cdot \begin{array}{l} \begin{bmatrix} 1 & 1 \\ 3 & 2 \end{bmatrix} \end{array} = \begin{array}{l} \begin{bmatrix} 0+6 & 0+4 \\ 14+18 & 14+12 \end{bmatrix} \end{array} = \begin{bmatrix} 6 & 4 \\ 32 & 26 \end{bmatrix}$$

b. $A(BC)$

$$\begin{array}{l} T \\ B \end{array} \begin{bmatrix} -2 & 0 \\ 4 & 2 \end{bmatrix} \cdot \begin{array}{l} L \quad R \\ \begin{bmatrix} 1 & 1 \\ 3 & 2 \end{bmatrix} \end{array} = \begin{array}{l} T \\ B \end{array} \begin{array}{l} L \quad R \\ \begin{bmatrix} -2+0 & -2+0 \\ 4+6 & 4+4 \end{bmatrix} \end{array} = \begin{bmatrix} -2 & -2 \\ 10 & 8 \end{bmatrix}$$

$$\begin{bmatrix} 2 & 1 \\ -1 & 3 \end{bmatrix} \cdot \begin{array}{l} \begin{bmatrix} -2 & -2 \\ 10 & 8 \end{bmatrix} \end{array} = \begin{array}{l} \begin{bmatrix} -4+10 & -4+8 \\ 2+30 & 2+24 \end{bmatrix} \end{array} = \begin{bmatrix} 6 & 4 \\ 32 & 26 \end{bmatrix}$$

c. Does the ASSOCIATIVE PROPERTY hold true for matrices?

Yes!

9-4 NOTES

Sec 1 H

Multiplying Matrices Day 2

Unit 9

Ex. 2: If $A = \begin{bmatrix} 2 & 1 \\ -1 & 3 \end{bmatrix}$, $B = \begin{bmatrix} -2 & 0 \\ 4 & 2 \end{bmatrix}$, and $C = \begin{bmatrix} 1 & 1 \\ 3 & 2 \end{bmatrix}$,
simplify each expression.

a. $A(B+C)$

$$\begin{bmatrix} 2 & 1 \\ -1 & 3 \end{bmatrix} \cdot \begin{bmatrix} -1 & 1 \\ 7 & 4 \end{bmatrix} = \begin{bmatrix} -2+7 & 2+4 \\ 1+21 & -1+12 \end{bmatrix} = \begin{bmatrix} 5 & 6 \\ 22 & 11 \end{bmatrix}$$

b. $AB + AC$

$$\begin{bmatrix} 0 & 2 \\ 14 & 6 \end{bmatrix} + \begin{bmatrix} 5 & 4 \\ 8 & 5 \end{bmatrix} = \begin{bmatrix} 5 & 6 \\ 22 & 11 \end{bmatrix}$$

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

c. Does the DISTRIBUTIVE PROPERTY hold true for matrices? *yes!*

9-4 NOTES

Sec 1 H

Multiplying Matrices Day 2

Unit 9

Identity Matrix:

$$[2] \cdot [1] = [2]$$

$$\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

$$\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

1's on the diagonal
0's everywhere else

Ex. 3: If $A = \begin{bmatrix} 2 & 1 \\ -1 & 3 \end{bmatrix}$, simplify each expression.

$$A \cdot B \neq B \cdot A$$

a. $AI = A$

b. IA

$$\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

$$\cdot \begin{bmatrix} 2 & 1 \\ -1 & 3 \end{bmatrix}$$

$$\stackrel{I}{=} \begin{bmatrix} 2 & 1 \\ -1 & 3 \end{bmatrix}$$

9-4 NOTES

Ex. 4: Simplify $\begin{bmatrix} -1 & 5 \\ 3 & 2 \end{bmatrix}^2 \neq \begin{bmatrix} 1 & 25 \\ 9 & 4 \end{bmatrix}$

$\begin{bmatrix} -1 & 5 \\ 3 & 2 \end{bmatrix} \cdot \begin{bmatrix} -1 & 5 \\ 3 & 2 \end{bmatrix}$

Ex. 5: Solve the each variable.

$\begin{bmatrix} 2 & y & 4 \\ 5 & 3 & 8 \\ -1 & -2 & 5 \end{bmatrix} \cdot \begin{bmatrix} x \\ 2 \\ 1 \end{bmatrix} = \begin{bmatrix} -4 \\ y \\ 4 \end{bmatrix}$

3×3 3×1

$2x + 2y + 4 = -4$

$5x + 6 + 8 = y$

$-x + -4 + 5 = 4$

$-x + 1 = 4$

$x = 3$

$x = -3$

$5(-3) + 6 + 8 = y$
 $-15 + 6 + 8$
 $-9 + 8$
 $-1 = y$