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Linear Algebra Sections 1594

Pg.32

1) Compute **u** + **v** and **u – 2v.**

u=$\begin{bmatrix} \mathbf{-1} \\ \mathbf{2} \end{bmatrix}$ **, v=** $\begin{bmatrix} \mathbf{-3} \\ \mathbf{-1} \end{bmatrix}$

$\begin{bmatrix} -1 \\ 2 \end{bmatrix} + \begin{bmatrix} -3 \\ -1 \end{bmatrix} = \begin{bmatrix} -4 \\ 1 \end{bmatrix}$ $\qquad$ $\begin{bmatrix} -1 \\ 2 \end{bmatrix} - 2\begin{bmatrix} -3 \\ -1 \end{bmatrix} = \begin{bmatrix} -1 \\ 2 \end{bmatrix} - \begin{bmatrix} -6 \\ -2 \end{bmatrix} = \begin{bmatrix} 5 \\ 4 \end{bmatrix}$

Pg.100

11) Compute *AD* and *DA.* Explain how the columns or rows of *A* change when *A* is multiplied by *D* on the right or on the left. Find a 3×3 matrix *B* , not the identity matrix or the zero matrix, such that *AB* = *BA.*

A = $\begin{bmatrix} 1 & 2 & 3 \\ 2 & 4 & 5 \\ 3 & 5 & 6 \end{bmatrix}$ **and** ***D*** **=** $\begin{bmatrix} 5 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & 2 \end{bmatrix}$

$$\begin{bmatrix} 1 & 2 & 3 \\ 2 & 4 & 5 \\ 3 & 5 & 6 \end{bmatrix} \times \begin{bmatrix} 5 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & 2 \end{bmatrix} = \begin{bmatrix} 1x5 + 2x0 + 3x0 & 1x0 + 2x3 + 3x0 & 1x0 + 2x0 + 3x2 \\ 2x5 + 4x0 + 5x0 & 2x0 + 4x3 + 5x0 & 2x0 + 4x0 + 5x2 \\ 3x5 + 5x0 + 6x0 & 3x0 + 5x3 + 6x0 & 3x0 + 5x0 + 6x2 \end{bmatrix}$$

A **D** **AD**

$$= \begin{bmatrix} 5 & 6 & 6 \\ 10 & 12 & 10 \\ 15 & 15 & 12 \end{bmatrix}$$

AD

$$\begin{bmatrix} 5 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & 2 \end{bmatrix} \times \begin{bmatrix} 1 & 2 & 3 \\ 2 & 4 & 5 \\ 3 & 5 & 6 \end{bmatrix} = \begin{bmatrix} 5x1 + 0x2 + 0x3 & 5x2 + 0x4 + 0x5 & 5x3 + 0x5 + 0x6 \\ 0x1 + 3x2 + 0x3 & 0x2 + 3x4 + 0x5 & 0x3 + 3x5 + 0x6 \\ 0x1 + 0x2 + 2x3 & 0x2 + 0x4 + 2x5 & 0x3 + 0x5 + 2x6 \end{bmatrix}$$

D **A** **DA**

$$= \begin{bmatrix} 5 & 10 & 15 \\ 6 & 12 & 15 \\ 6 & 10 & 12 \end{bmatrix}$$

DA

When A is multiplied by D we are multiplying the rows of A times the columns of D, and when D is multiplied by A we are multiplying the rows of D times the columns of A.

$$\begin{bmatrix} \mathbf{1} & \mathbf{2} & \mathbf{3} \\ \mathbf{2} & \mathbf{4} & \mathbf{5} \\ \mathbf{3} & \mathbf{5} & \mathbf{6} \end{bmatrix} \text{x} \begin{bmatrix} \mathbf{5} & \mathbf{0} & \mathbf{0} \\ \mathbf{0} & \mathbf{5} & \mathbf{0} \\ \mathbf{0} & \mathbf{0} & \mathbf{5} \end{bmatrix} = \begin{bmatrix} 1x5 + 2x0 + 3x0 & 1x0 + 2x5 + 3x0 & 1x0 + 2x0 + 3x5 \\ 2x5 + 4x0 + 5x0 & 2x0 + 4x5 + 5x0 & 2x0 + 4x0 + 5x5 \\ 3x5 + 5x0 + 6x0 & 3x0 + 5x5 + 6x0 & 3x0 + 5x0 + 6x5 \end{bmatrix}$$

A **B** **AB**

$$= \begin{bmatrix} \mathbf{5} & \mathbf{10} & \mathbf{15} \\ \mathbf{10} & \mathbf{20} & \mathbf{25} \\ \mathbf{15} & \mathbf{25} & \mathbf{30} \end{bmatrix}$$

$$\begin{bmatrix} \mathbf{5} & \mathbf{0} & \mathbf{0} \\ \mathbf{0} & \mathbf{5} & \mathbf{0} \\ \mathbf{0} & \mathbf{0} & \mathbf{5} \end{bmatrix} \text{x} \begin{bmatrix} \mathbf{1} & \mathbf{2} & \mathbf{3} \\ \mathbf{2} & \mathbf{4} & \mathbf{5} \\ \mathbf{3} & \mathbf{5} & \mathbf{6} \end{bmatrix} = \begin{bmatrix} 5x1 + 0x2 + 0x3 & 5x2 + 0x4 + 0x5 & 5x3 + 0x5 + 0x6 \\ 0x1 + 5x2 + 0x3 & 0x2 + 5x4 + 0x5 & 0x3 + 5x5 + 0x6 \\ 0x1 + 0x2 + 5x3 & 0x2 + 0x4 + 5x5 & 0x3 + 0x5 + 5x6 \end{bmatrix}$$

B **A** **BA**

$$= \begin{bmatrix} \mathbf{5} & \mathbf{10} & \mathbf{15} \\ \mathbf{10} & \mathbf{20} & \mathbf{25} \\ \mathbf{15} & \mathbf{25} & \mathbf{30} \end{bmatrix}$$

$$\begin{bmatrix} \mathbf{5} & \mathbf{10} & \mathbf{15} \\ \mathbf{10} & \mathbf{20} & \mathbf{25} \\ \mathbf{15} & \mathbf{25} & \mathbf{30} \end{bmatrix} = \begin{bmatrix} \mathbf{5} & \mathbf{10} & \mathbf{15} \\ \mathbf{10} & \mathbf{20} & \mathbf{25} \\ \mathbf{15} & \mathbf{25} & \mathbf{30} \end{bmatrix}$$

AB* = *BA