

# Homework 2.1

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1.

$$-2A = \begin{bmatrix} -4 & 0 & 2 \\ -8 & 10 & -4 \end{bmatrix}$$

$$B - 2A = \begin{bmatrix} 3 & -5 & 3 \\ -7 & 6 & -7 \end{bmatrix}$$

Rx

$$CD = \begin{bmatrix} 1 & 2 \\ -2 & 1 \end{bmatrix} \begin{bmatrix} 3 & 5 \\ -1 & 4 \end{bmatrix} = \begin{bmatrix} 1 & 13 \\ -7 & -6 \end{bmatrix}$$

3.

$$3I_2 - A = 3 \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} - \begin{bmatrix} 4 & -1 \\ 5 & -2 \end{bmatrix}$$

$$\begin{bmatrix} 3 & 0 \\ 0 & 3 \end{bmatrix} - \begin{bmatrix} 4 & -1 \\ 5 & -2 \end{bmatrix} = \begin{bmatrix} -1 & 1 \\ -5 & 5 \end{bmatrix}$$

$$3I_2 A = \begin{bmatrix} 3 & 0 \\ 0 & 3 \end{bmatrix} \begin{bmatrix} 4 & -1 \\ 5 & -2 \end{bmatrix} = \begin{bmatrix} 12 & -3 \\ 15 & -6 \end{bmatrix}$$

6.

$$Ab_1 = \begin{bmatrix} 4 & -2 \\ -3 & 0 \\ 3 & 5 \end{bmatrix} \begin{bmatrix} 1 \\ 2 \end{bmatrix} = \begin{bmatrix} 0 \\ -3 \\ 13 \end{bmatrix}$$

$$Ab_2 = 11 \begin{bmatrix} 3 \\ -1 \end{bmatrix} = \begin{bmatrix} 14 \\ -9 \\ 4 \end{bmatrix}$$

$$\begin{bmatrix} 0 & 14 \\ -3 & -9 \\ 13 & 4 \end{bmatrix}$$

$$\begin{bmatrix} 4 & -2 \\ -3 & 0 \\ 3 & 5 \end{bmatrix} \begin{bmatrix} 1 & 3 \\ 2 & -1 \end{bmatrix} = \begin{bmatrix} 0 & 14 \\ -3 & -9 \\ 13 & 4 \end{bmatrix}$$



7.  $B = 3 \times 7$  matrix

10.  $B \neq C$  because they are independent of each other and have different values

$$AB = \begin{bmatrix} 1 & -7 \\ -2 & 14 \end{bmatrix} = AC = \begin{bmatrix} 1 & -7 \\ -2 & 14 \end{bmatrix}$$

11.

$$AD = \begin{bmatrix} 2 & 3 & 5 \\ 2 & 6 & 15 \\ 2 & 12 & 25 \end{bmatrix}$$

$$DA = \begin{bmatrix} 2 & 2 & 2 \\ 3 & 6 & 9 \\ 2 & 20 & 25 \end{bmatrix}$$

$$A^2 = B = \begin{bmatrix} 3 & 7 & 9 \\ 6 & 17 & 22 \\ 10 & 29 & 38 \end{bmatrix}$$

$$AB = BA$$



12.

$$B = \begin{bmatrix} 1 & 2 \\ 2 & 4 \end{bmatrix} \quad \left| \quad \begin{bmatrix} 3 & -6 \\ -1 & 2 \end{bmatrix} \begin{bmatrix} a & b \\ c & d \end{bmatrix} \right.$$

$$\begin{bmatrix} 3a-6c & 3b-6d \\ -a+2c & -b+2d \end{bmatrix} = \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$$

16.

a. false  $3 \times 3$  matrix

b. True,  $A_2 B = [a_{21}b_{11} + a_{22}b_{21}, \text{etc.}]$

c. False non commutative

d. False Theorem 3

e. True  $(A+B)^T = A^T + B^T$

22.

$$Bx=0 = A(Bx) = A0 = ABx = 0$$

= independent

27.

$$u^T v = -2a + 3b - 4c$$

$$v^T u = -2a + 3b - 4c$$

$$uu^T = \begin{bmatrix} -2a & -2b & -2c \\ 3a & 3b & 3c \\ -4a & -4b & -4c \end{bmatrix}$$

$$vu^T = \begin{bmatrix} -2a & 3a & -4a \\ -2b & 3b & -4b \\ -2c & 3c & -4c \end{bmatrix}$$