Homework

1. Find x and y

$$\begin{bmatrix} 16 & 4 & 5 & 4 \\ -3 & 13 & 15 & 6 \\ 0 & 2 & 4 & 0 \end{bmatrix} = \begin{bmatrix} 16 & 4 & 2x+1 & 4 \\ -3 & 13 & 16 & 3x \\ 0 & 2 & 3y-5 & 0 \end{bmatrix}$$

Find if possible, *a*) $A+B$ *b*) $A-B$ *c*) $2A$ *d*) $2A-B$ *e*) $B+\frac{1}{2}A$

2. $A = \begin{pmatrix} 1 & 2 \\ 2 & 1 \end{pmatrix}$ $B = \begin{pmatrix} -3 & -2 \\ 4 & 2 \end{pmatrix}$

3. $A = \begin{pmatrix} 6 & 0 & 3 \\ -1 & -4 & 0 \end{pmatrix}$ $B = \begin{pmatrix} 8 & -1 \\ 4 & -3 \end{pmatrix}$

Find if possible, *a*) AB *b*) BA

4. $A = \begin{pmatrix} 1 & 2 \\ 4 & 2 \end{pmatrix}$ $B = \begin{pmatrix} 2 & -1 \\ -1 & 8 \end{pmatrix}$

5. $A = \begin{pmatrix} 2 & 1 \\ -3 & 4 \\ 1 & 6 \end{pmatrix}$ $B = \begin{pmatrix} 0 & -1 & 0 \\ 4 & 0 & 2 \\ 8 & -1 & 7 \end{pmatrix}$

Determine the size of the matrix. A: 3×4 B: 3×4 C: 4×2 D: 4×2 E: 4×3

6. $E-2A$

7. $2D+C$

8. Solve the matrix equation $AX = 0$

$$A = \begin{bmatrix} 2 & -1 & -1 \\ 1 & -2 & 2 \end{bmatrix} \quad X = \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} \quad O = \begin{bmatrix} 0 \\ 0 \end{bmatrix}$$

9. Write the system linear equations in the form $AX = B$ Solve the matrix equation for X.

$$\begin{cases} -x_1 + x_2 = 4 \\ -2x_1 + x_2 = 0 \end{cases}$$

10. Write the column matrix $\boldsymbol{b}$ as a linear combination of the columns of A.

$$A = \begin{bmatrix} 1 & -1 & 2 \\ 3 & -3 & 1 \end{bmatrix} \qquad \boldsymbol{b} = \begin{bmatrix} -1 \\ 7 \end{bmatrix}$$

11. Solve for A: $\begin{bmatrix} 1 & 2 \\ 3 & 5 \end{bmatrix} A = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

12. Solve for *a, b, c, and d*: $\begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}\begin{bmatrix} a & b \\ c & d \end{bmatrix} = \begin{bmatrix} 6 & 3 \\ 19 & 2 \end{bmatrix}$

13. Find the products *AB* and *BA* for the diagonal matrices

$$A = \begin{pmatrix} 2 & 0 \\ 0 & -3 \end{pmatrix} \qquad B = \begin{pmatrix} -5 & 0 \\ 0 & 4 \end{pmatrix}$$

14. Prove that each statement is true when *A* and *B* are square matrices of order *n* and *c* is a scalar.

a) $Tr(A+B) = Tr(A) + Tr(B)$

b) $Tr(cA) = cTr(A)$

15. Verify $AB = BA$ for the matrices below

$$A = \begin{pmatrix} \cos\alpha & -\sin\alpha \\ \sin\alpha & \cos\alpha \end{pmatrix} \qquad B = \begin{pmatrix} \cos\beta & -\sin\beta \\ \sin\beta & \cos\beta \end{pmatrix}$$

16. Perform the operation $aA + bB$, given $a = 3,\ \ b = -4$

$$A = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix} \quad B = \begin{pmatrix} 0 & 1 \\ -1 & 2 \end{pmatrix}$$

17. Solve for *X* in the equation $3X + 2A = B$, given

$$A = \begin{pmatrix} -4 & 0 \\ 1 & -5 \\ -3 & 2 \end{pmatrix} \quad \textit{and} \quad B = \begin{pmatrix} 1 & 2 \\ -2 & 1 \\ 4 & 4 \end{pmatrix}$$

18. Perform the operation $(B+C)A$; given

$$A = \begin{pmatrix} 1 & 2 & 3 \\ 0 & 1 & -1 \end{pmatrix};\quad B = \begin{pmatrix} 1 & 3 \\ -1 & 2 \end{pmatrix};\quad C = \begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix}$$

19. Show that *AB* and *BA* are not equal for the given matrices $A = \begin{pmatrix} -2 & 1 \\ 0 & 3 \end{pmatrix};\quad B = \begin{pmatrix} 4 & 0 \\ -1 & 2 \end{pmatrix}$

20. Show that $AC = BC$, even though $A \neq B$ $\quad A = \begin{pmatrix} 0 & 1 \\ 0 & 1 \end{pmatrix};\quad B = \begin{pmatrix} 1 & 0 \\ 1 & 0 \end{pmatrix};\quad C = \begin{pmatrix} 2 & 3 \\ 2 & 3 \end{pmatrix}$