

Worksheet

1. Find $A = [a_{ij}]_{3 \times 3}$ If $a_{ij} = \begin{cases} 5 - j + i & ; i \neq j \\ 2i - j & ; i = j \end{cases}$

2. Find x, y, a and b

$$2.1 \begin{bmatrix} 4x - 3y \\ 5 \\ 7 \\ -3a + 5b \end{bmatrix} = \begin{bmatrix} -6 \\ 3x - 4y \\ 2a - 3b \\ 9 \end{bmatrix}$$

$$2.2 \begin{bmatrix} x^2 & 6 \\ y^2 & -7 \end{bmatrix} = \begin{bmatrix} 25 & 6 \\ 4 & x - 2 \end{bmatrix}$$

3. Let $A = \begin{bmatrix} 2 & 1 & -4 \\ 5 & 0 & 3 \end{bmatrix}_{2 \times 3}$, $B = \begin{bmatrix} 1 & 1 \\ -1 & 1 \\ 2 & 0 \end{bmatrix}_{3 \times 2}$, $C = \begin{bmatrix} 5 & 3 & 2 \\ -4 & 4 & 1 \\ 1 & -1 & 1 \end{bmatrix}_{3 \times 3}$, $D = \begin{bmatrix} -3 & 4 \\ -1 & -2 \end{bmatrix}_{2 \times 2}$ and

$E = \begin{bmatrix} 4 & -5 & 2 \\ 2 & 3 & -1 \\ -1 & 4 & 1 \end{bmatrix}_{3 \times 3}$ If possible, compute;

3.1 $C + E$

3.2 $3C - 4E$

3.3 $-5E$

3.4 AB and BA

3.5 $2CB - EB$

3.6 $(C + E)(C - E)$ and $C^2 - E^2$

4. Let $A = \begin{bmatrix} -1 & 5 \\ 2 & 4 \end{bmatrix}_{2 \times 2}$, $B = \begin{bmatrix} -2 & -1 \\ 5 & 4 \end{bmatrix}_{2 \times 2}$, $C = \begin{bmatrix} 1 & 8 \\ -6 & 0 \end{bmatrix}_{2 \times 2}$ and $3 \left[\frac{2}{3}(A + B) + \frac{1}{2}X \right] = \frac{6}{5}(A - 3C)$
find X

5. Let $A = \begin{bmatrix} 1 & 4 & -5 \\ -2 & 3 & -1 \end{bmatrix}_{2 \times 3}$ and $B = \begin{bmatrix} 2 & 1 \\ 3 & -2 \\ 7 & -1 \end{bmatrix}_{3 \times 2}$. If possible, compute;

5.1 $(AB)^T$

5.2 $B^T A^T$

6. If $AB = BA$ Show;

$$(A + B)^2 = A^2 + 2AB + B^2$$

7. Let $A = \begin{bmatrix} 3 & 1 & 2 \\ 4 & -1 & -4 \\ 2 & -1 & 5 \end{bmatrix}_{3 \times 3}$. If possible, compute; $\text{Tr}(3A^2)$

8. Let $A = \begin{bmatrix} 0 & -1 & 1 \\ -1 & 4 & -3 \end{bmatrix}_{2 \times 3}$, $B = \begin{bmatrix} -2 & 1 \\ -1 & 1 \\ 2 & 3 \end{bmatrix}_{3 \times 2}$, $C = \begin{bmatrix} 5 & -2 & 0 \\ 4 & 5 & -1 \\ 1 & -3 & 1 \end{bmatrix}_{3 \times 3}$, $D = \begin{bmatrix} -1 & 3 \\ 2 & 3 \end{bmatrix}_{2 \times 2}$ and

$E = \begin{bmatrix} -1 & -4 & -2 \\ 3 & 5 & -1 \\ 2 & -1 & 1 \end{bmatrix}_{3 \times 3}$. If possible, compute

8.1 $A^T B + \frac{4}{5}(B^T)^T$

8.2 $BB^T - CE$

8.3 $C + C^T - 2E^T$

$$8.4 \mathbf{C}^2 - \mathbf{E}^2$$

$$8.5 \text{Tr}(\mathbf{D}\mathbf{D}^T)^T$$

$$8.6 \text{Tr}[\mathbf{A} + \mathbf{B}^T - (\mathbf{D}\mathbf{A})^T]$$

9. Let $A = \begin{bmatrix} 2i & -\frac{3}{4} & 1 & -1 \end{bmatrix}_{1 \times 4}$, $B = \begin{bmatrix} -i & 2-2i & 5 & -i \\ 0 & 2 & 3-2i & 0 \\ -1 & 4 & 3i & i+2 \end{bmatrix}_{3 \times 4}$

find \bar{A}, \bar{B}, A^* and B^*

10. Find AB ;

10.1 $A = \begin{bmatrix} 2 & 2 & 2 & 3 \\ 5 & -1 & -8 & 1 \\ 2 & 5 & 4 & 0 \end{bmatrix}$ $B = \begin{bmatrix} 4 & -1 & 1 \\ -1 & 5 & -1 \\ 6 & 0 & 0 \\ 1 & -5 & 7 \end{bmatrix}$

10.2 $A = \begin{bmatrix} 3 & -1 & 2 & 3 \\ -5 & -2 & 0 & 1 \\ 1 & 4 & -7 & 4 \end{bmatrix}$ $B = \begin{bmatrix} 1 & -1 & 2 \\ -2 & 1 & 0 \\ 6 & 5 & -2 \\ 2 & -5 & 1 \end{bmatrix}$

$$10.3 \mathbf{A} = \begin{bmatrix} -3 & 2 & 1 & -5 \\ 1 & 1 & -3 & 2 \end{bmatrix} \mathbf{B} = \begin{bmatrix} 2 & -5 & 4 \\ -2 & 2 & 1 \\ 7 & 4 & 3 \\ 5 & -5 & 7 \end{bmatrix}$$

$$10.4 \mathbf{A} = \begin{bmatrix} 0 & -1 & 1 & 0 & 0 \\ 4 & 0 & 0 & 0 & 0 \\ 1 & -3 & 2 & 0 & 0 \\ 0 & 0 & 0 & -1 & 0 \\ 0 & 0 & 0 & 0 & -1 \end{bmatrix} \mathbf{B} = \begin{bmatrix} 0 & 0 & 1 & 3 & 3 \\ 0 & 0 & 0 & 1 & 1 \\ 0 & 0 & 0 & -1 & 1 \\ 0 & 4 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 & 0 \end{bmatrix}$$

11. Let $A = \begin{bmatrix} 4 & 2 & -1 & 2 \\ -2 & 3 & 5 & 8 \\ 0 & 2 & -3 & 4 \end{bmatrix}_{3 \times 4}$ find $R_3 \rightarrow -\frac{3}{4}R_3$, $R_1 \rightarrow -5R_2 + R_1$, $C_1 \rightarrow -7C_1$ and $C_4 \rightarrow 6C_1 + C_4$

12. Let $I_4 = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{4 \times 4}$ find E_{13} , $E_2(1)$ and $E_{24}(2)$

13. Let $I_5 = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{bmatrix}_{5 \times 5}$ find $F_{13}, F_2(-3)$ and $F_{24}(2)$