Assignment-1 (NCERT Exercise 3.2- Operations On Matrices)

1. If $A=\begin{bmatrix}1 & 4 & 3\\ -1 & 0 & 8\\ 11 & 5 & 13\end{bmatrix}$ and B = $\begin{bmatrix}2 & 3 & 8\\ 5 & -9 & 12\\ 0 & 11 & -2\end{bmatrix}$ find A + 3B
2. Find $3I_3$- A where A is given by : A = $\begin{bmatrix}1 & 9 & 5\\ 0 & 12 & -8\\ 1 & 3 & 5\end{bmatrix}$
3. Simplify the Following : sinθ $\begin{bmatrix}\sin\theta & -\cos\theta\\ \cos\theta & \sin\theta\end{bmatrix}$ + $\cos\theta\begin{bmatrix}\cos\theta & \sin\theta\\ -\sin\theta & \cos\theta\end{bmatrix}$ - diagonal [1,1]
4. If X – 2Y = $\begin{bmatrix}1 & 5 & 9\\ 3 & 8 & 12\end{bmatrix}$ and Y- 2X = $\begin{bmatrix}3 & 5 & 0\\ 1 & 9 & 11\end{bmatrix}$, find the value of X and Y
5. If A = $\begin{bmatrix}2 & 3\\ 5 & 8\end{bmatrix}$ and B = $\begin{bmatrix}1 & 6\\ 11 & 8\end{bmatrix}$, find a matrix C, such that 2A + 3B + 4C is an identity matrix.
6. If A, B and C are three matrices such that A= $\begin{bmatrix}1 & 2\\ 5 & 9\end{bmatrix}_{2x2}$, B = $\begin{bmatrix}1 & 5 & 3\\ 3 & 9 & 11\end{bmatrix}_{2x3}$, C = $\begin{bmatrix}1 & 0\\ 9 & 3\\ 1 & 5\end{bmatrix}_{3x2}$, Find ABC

7. Prove that the product of the matrices $\begin{bmatrix}\cos^2\theta & \sin 2\theta/2\\ \sin 2\theta/2 & \sin^2\theta\end{bmatrix}$ and $\begin{bmatrix}\cos^2\varphi & \sin 2\varphi/2\\ \sin 2\varphi/2 & \sin^2\varphi\end{bmatrix}$ is the null matrix when θ and φ differ by an odd multiple of $\frac{\pi}{2}$

8. Explain why in general
   i. $A^2- B^2 \neq (A+B)(A-B)$ and
   ii. $(A\pm B)^2 \neq A^2 \pm 2AB + B^2$, where, A and B are any given matrices
9. If $A=\begin{bmatrix}0 & 1\\ 1 & 0\end{bmatrix}$, B = $\begin{bmatrix}0 & -i\\ i & 0\end{bmatrix}$, C = $\begin{bmatrix}1 & 0\\ 0 & -1\end{bmatrix}, where\ i=\sqrt{-1}$. Show that AB =- BA, AC = - CA , BC = -CB
10. Give an example of three matrices A, B and C to show that AB = AC⇨ B ≠ C i.e.. even if B and C are different still AB can be equal to AC
11. Find a matrix B, such that $\begin{bmatrix}6 & 5\\ 5 & 6\end{bmatrix}$ B = $\begin{bmatrix}11 & 0\\ 0 & 11\end{bmatrix}$

12. Find the value of x , such that $\begin{bmatrix}1 & 2 & 1\end{bmatrix}\begin{bmatrix}1 & 2 & 0\\ 2 & 0 & 1\\ 1 & 0 & 2\end{bmatrix}\begin{bmatrix}0\\ 0\\ x\end{bmatrix} = O$

13. if A = $\begin{bmatrix}5 & 3\\ 12 & 7\end{bmatrix}$, then verify that $A^2 - 12A - I = O$ where I is a unit matrix of order 2 and O is a null matrix of order 2

14. if A = $\begin{bmatrix}\cos\theta & i\sin\theta\\ i\sin\theta & \cos\theta\end{bmatrix}$, then prove that : $A^n = \begin{bmatrix}\cos n\theta & i\sin n\theta\\ i\sin n\theta & \cos n\theta\end{bmatrix}$

ANSWERS

1. $\begin{bmatrix}7 & 13 & 27\\ 14 & -27 & 44\\ 11 & 38 & 7\end{bmatrix}$

2. $\begin{bmatrix}2 & -9 & -5\\ 0 & -9 & 8\\ -1 & -3 & -2\end{bmatrix}$

3. $\begin{bmatrix}0 & 0\\ 0 & 0\end{bmatrix}$ = null matrix

4. X = $\begin{bmatrix}-7/3 & -5 & -3\\ -5/3 & -26/3 & -34/3\end{bmatrix}$, Y = $\begin{bmatrix}-5/3 & -5 & -6\\ -7/3 & -25/3 & -35/3\end{bmatrix}$

5. C = $\begin{bmatrix}-3/2 & -6\\ -43/4 & -39/4\end{bmatrix}$

6. ABC = $\begin{bmatrix}239 & 194\\ 1100 & 888\end{bmatrix}$

10. A = $\begin{bmatrix}2 & 2 & 2\\ 4 & 4 & 4\end{bmatrix}$, B = $\begin{bmatrix}-4 & 18\\ 2 & -30\\ 8 & 6\end{bmatrix}$, C = $\begin{bmatrix}8 & 6\\ -8 & -18\\ 6 & 6\end{bmatrix}$

11.B = $\begin{bmatrix} 6 & -5 \\ -5 & 6 \end{bmatrix}$

12.X = 0