Matrices Tutorial 1

Q1. What is the rank of the following matrices:

i) $A=\begin{bmatrix}2 & 3\\ 3 & 5\\ 2 & 4\\ 1 & 6\end{bmatrix}$ *ii)* $B=\begin{bmatrix}1 & -2\\ 3 & 4\end{bmatrix}$ *iii)* $C=\begin{bmatrix}1 & 4 & 8\\ 2 & -5 & 2\\ 3 & 6 & -1\end{bmatrix}$ *iv)* $D=\begin{bmatrix}-5 & 1 & 2\\ 4 & -1 & 4\\ 3 & 0 & 5\\ 2 & 1 & -2\end{bmatrix}$

v) $E=\begin{bmatrix}1 & 4 & 6 & 3\\ 0 & 5 & 9 & 5\\ 7 & -1 & 6 & -5\\ 12 & 6 & 8 & 4\\ -2 & 3 & 4 & 0\end{bmatrix}$

Q2. Using the matrices in question 1, write down the elements below:

a_{12}, a_{31}, a_{22}, a_{42}, b_{22}, b_{12}, c_{23}, c_{32}, c_{13}, d_{22}, d_{41}, d_{33}, d_{23}, e_{14}, e_{23}, e_{43}, e_{53}, e_{11}, e_{44}

Q3. Evaluate the following:

i) $\begin{bmatrix}2 & 3\\ -4 & 3\end{bmatrix}+\begin{bmatrix}1 & 2\\ 5 & 4\end{bmatrix}$ *ii)* $\begin{bmatrix}5 & -1\\ 6 & 2\end{bmatrix}-\begin{bmatrix}4 & -1\\ 7 & -2\end{bmatrix}$ *iii)* $\begin{bmatrix}3 & 2 & 5\\ 4 & 1 & -3\\ -1 & 0 & -2\end{bmatrix}-\begin{bmatrix}-2 & 3 & 5\\ 5 & 1 & -3\\ 3 & 2 & -1\end{bmatrix}$

iv) $\begin{bmatrix}1 & 4 & 0\\ 2 & 8 & -2\\ -3 & 5 & -5\end{bmatrix}-\begin{bmatrix}-1 & 4 & 3\\ -2 & -5 & -2\\ 5 & 0 & -1\end{bmatrix}$ *v)* $\begin{bmatrix}1 & 3 & 9 & 6\\ 2 & -1 & 4 & 7\\ 3 & -2 & 0 & 9\\ 4 & 6 & 7 & 2\\ -3 & 0 & 9 & 1\end{bmatrix}-\begin{bmatrix}3 & -2 & 1 & 6\\ 2 & -4 & 0 & 2\\ 3 & 9 & -1 & 4\\ 0 & 7 & -3 & 8\\ 7 & 0 & 4 & -6\end{bmatrix}$

Q4. Consider the following matrices,

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

$$D=\begin{bmatrix}2 & 0 & 3\\ 1 & 2 & -4\\ -1 & 1 & -2\end{bmatrix} \qquad E=\begin{bmatrix}0 & 1 & 4\\ 2 & -1 & -3\\ -2 & 0 & -2\end{bmatrix} \qquad F=\begin{bmatrix}3\\ -2\\ 1\end{bmatrix}$$

Calculate

i) AB, 2) AD, 3) BE, 4) BF, 5) (A+B)F, 6) AI, 7) 2A, 8) A-E, 9) B/2

Q5.

a) Calculate AB in each case:

i) $A=\begin{bmatrix}1 & 3\\ -1 & 3\end{bmatrix}$ $B=\begin{bmatrix}2 & 0\\ -1 & 1\end{bmatrix}$ *ii)* $A=\begin{bmatrix}1 & 3\\ -5 & 3\end{bmatrix}$ $B=\begin{bmatrix}1 & 0 & -1\\ -1 & 2 & -2\end{bmatrix}$

iii) $A=\begin{bmatrix}1 & 2\\ -4 & 2\end{bmatrix}$ $B=\begin{bmatrix}-1\\ 2\end{bmatrix}$ *iv)* $A=\begin{bmatrix}0 & 1 & -2\\ 2 & -1 & -1\end{bmatrix}$ $B=\begin{bmatrix}3 & 1\\ -4 & 3\\ 2 & 0\end{bmatrix}$