ASSIGNMENT-1



Q1. Let $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} 5 & 6 \\ 7 & 8 \end{bmatrix}$

$$A^{-1} = \frac{1}{-2} \begin{bmatrix} 4 & -2 \\ -3 & 1 \end{bmatrix} = A^{-2} \begin{bmatrix} 1 \\ 3 & -1 \end{bmatrix}$$

$$AB = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix} \begin{bmatrix} 5 & 6 \\ 7 & 8 \end{bmatrix} = \begin{bmatrix} 19 & 22 \\ 43 & 50 \end{bmatrix}$$

$$(A G) A^{-1} = \begin{bmatrix} 19 & 22 \\ 43 & 50 \end{bmatrix} \begin{bmatrix} -2 \\ 3/2 & -1/2 \end{bmatrix}$$

$$= \begin{bmatrix} -38 + 33 & 19 - 11 \\ -86 + 75 & 43 - 25 \end{bmatrix} \begin{bmatrix} -5 & 8 \\ -11 & 18 \end{bmatrix}$$

Tr (ABA") = Tr (B)

$$\Rightarrow -5+18 = 5+8$$

 $\Rightarrow 13 = 13$
Hence proved

$$A = \begin{bmatrix} 0 & 1 \\ 0 & 0 \end{bmatrix}; A = 0$$
 $B = \begin{bmatrix} 0 & 2 & 1 & 6 \\ 0 & 0 & 1 & 2 \\ 0 & 0 & 0 & 3 \\ 0 & 0 & 0 & 0 \end{bmatrix}; B = 0$

$$C = \begin{bmatrix} 5 & -3 & 2 \\ 15 & -9 & 6 \\ 10 & -6 & 4 \end{bmatrix}$$
; $C = 0$ $D = \begin{bmatrix} 5 & 5 & 5 \\ 6 & 6 & 6 \\ -11 & -11 & -11 \end{bmatrix}$, $D^2 = 0$

20 a) u = [2, -5, 6] and v=[2, 8, -1] U.V = 2x2-5x8-6x1 = 4-40-6 = -42 (b) u=[6,6,-9,6,-4] and v=[-3,5,-1,0,5] uv = -6x3+6x5+9x1+6x0-4x5 = -18+30+9+0-20=1

u=[3,1,6] and v=[-2,1,4] $|u| = \sqrt{3} + (^{2} + 6^{2}) = \sqrt{46}$ $|v| = \sqrt{(2)^{2} + (^{2} + 6^{2})} = \sqrt{21}$ uv=-3x2+1x1+6x4=-6+1+24=19

$$\cos 0 = u \cdot y = 19$$

$$|u||v| = \sqrt{46 \times 21} \approx 31$$

 $0 = \cos^2(19) - 0.911$ nad

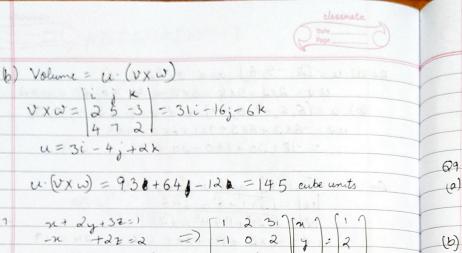
(b)
$$\rho roj(u,v) = \frac{u \cdot v \cdot v}{|v|^2} = \frac{19}{(21)^2} \begin{bmatrix} -28, 1, 4 \end{bmatrix} = \begin{bmatrix} -38, 19, 76 \\ 21, 21, 21 \end{bmatrix}$$

Q5. a) u = Pa = [6-1, 1-(-2), -5-4] = [5, 3, -9](b) u = Pa = [1-2, 5-3, -3-(6), 6-5] = [-1, 2, 3, 1]

Q6
$$u = 3i - 4j + 2k$$
, $v = 2i + 5j - 3k$, $w = 4i + 7j + 2k$
(a) ijk
 $u \times v = 3 - 42 = i(12 - 10) - j(-9 - 4) + k(15 + 8)$
 $25 - 3 = 2i + 13j + 23k$

 $u \times w = \frac{1}{3} - \frac{1}{4} = \frac{1}{2} = \frac{1}{2} (-8 - 14) - \frac{1}{2} (6 - 8) + \frac{1}{2} (2) + \frac{1}{6}$

$$VX \omega = \begin{cases} 1 & 1 \\ 2 & 5 \\ 4 & 7 \\ 2 & 5 \end{cases} = i(10+21) - j(4+12) + k(14-20)$$



$$D = 1(4) - 2(-1) + 3(2) = 12$$

$$D_{x} = \begin{vmatrix} 1 & 2 & 3 \\ 2 & 0 & 2 \end{vmatrix} = 1(4) - 2(2+4) + 3(-4) = -20$$

$$0y = \begin{bmatrix} 1 & 1 & 3 \\ -1 & 2 & 2 \end{bmatrix} = 1(2+4) - 1(-1) + 3(2) = 13$$

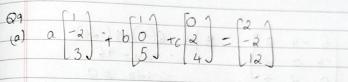
$$D_2 = \begin{vmatrix} 1 & 2 & 1 \\ -1 & 0 & 2 \end{vmatrix} = 1(4) - 2(2) + 1(2) = 2$$

$$\begin{vmatrix} 0 & -2 & -2 \\ -2 & -2 \end{vmatrix}$$



$$= \frac{1(1-4)-2(2-4)+2(4-2)}{2(1-3)-2(-2)+2(2)}$$

$$= \frac{3+4+4}{2}$$



$$R_3 \rightarrow R_3 - 3R$$
, $\begin{bmatrix} 1 & 1 & 0 & 2 \\ 0 & 1 & 1 & 1 \\ 0 & 2 & 4 & 6 \end{bmatrix}$ $R_3 \rightarrow R_3$ $\begin{bmatrix} 1 & 1 & 0 & 2 \\ 0 & 1 & 2 & 1 \\ 0 & 1 & 2 & 3 \end{bmatrix}$

$$R_1 \rightarrow R_1 - R_2$$
 [1003] Nowe in echelon form

010-1 3 One unique solution

0012 where $a=3$, $b=-1$, $c=2$

$$= 73v_1 - v_2 + 2v_3 = b$$

Q10.
$$A = \begin{bmatrix} 0 & 3 & 5 \\ 3 & 5 & 0 \\ 5 & 0 & 10 \end{bmatrix}$$

$$= -2 \begin{bmatrix} 15 & 15 \\ -25 \end{bmatrix}$$

$$\Rightarrow Rank(A) = 3$$

$$B = \begin{bmatrix} 6 & -4 & 0 \\ -4 & 0 & 2 \\ 0 & 2 & 6 \end{bmatrix}$$

$$= -24 - 96$$

$$\Rightarrow Rank(B) = 3$$