Q1 a/ Express the equation of Plane passing through the Points

$A(2,-2,1)$, $B(-1,0,3)$, $C(5,-3,4)$

Sol:

The non Parallel vectors.

$\overrightarrow{P_1P_2} = (-3,2,2)$ $\quad (-1,0,3)-(2,-2,1)$

$\overrightarrow{P_1P_3} = (3,-1,3)$ $\quad (-1,0,3)-(2,+2,-1)$

$(-3,+2,2)$

The Perpendicular vector is.

$m = \overrightarrow{P_1P_2} \times \overrightarrow{P_1P_3}$ $\quad P_1P_2 = \sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$

$P_1P_2 = \sqrt{(-1-2)^2+}$

$$m = \begin{vmatrix} i & j & k \\ -3 & 2 & 2 \\ 3 & -1 & 3 \end{vmatrix}$$

$m = i(6+2)-j(-9-6)+k(3-6)$

$m = 8i+15j-3k$

$m = (8,15,-3)$

Now: $P_1(x_0, y_0, z_0) = (2,-3,1)$

$m(a,b,c) = (8,15,-3)$

So equation of plane is

$a(x-x_0)+b(y-y_0)+c(z-z_0)=0$

$8((x-2)+15(y+z)-3(z-1)=0$

$8x+15y-3z-16+30+3=0$

$\boxed{8x+15y-3z+17=0}$ //

11743 Anees Sher

Q1 (b) Express a pair of planes whoes intersection is the given line.

$x = 2, 3t, y + t, z = 9 - 4t$.

Sol:

$x - 2 = -3t \Rightarrow t = \frac{x-2}{-3}$

$y - 3 = t \Rightarrow t = \frac{y-3}{1}$

$z - 2 = -4t \Rightarrow t = \frac{z-2}{-4}$

So $\frac{x-2}{-3} = \frac{y-3}{1} = \frac{z-2}{-4}$

For 1st plane takes 1st & second.

$\frac{x-2}{-3} = \frac{y-3}{1}$

$x - 2 = -3y + 9$

$x + 3y - 10 = 0$

For second plane take 1st & 3rd.

$\frac{x-2}{-3} = \frac{z-2}{-4}$

$-4x + 8 = -3z + 6$

$-4x + 3z + 2 = 0$

or $4x - 3z - 2 = 0$ //

Q2//

$$L(x, y) = (x1, y, x+y)$$

Solution:

$$L(x, y) = (x+1, y, x+y)$$

Let $U = (x_1, y_1)$ $V = (x_2, y_2)$

$$U + V = (x_1, y_1) + (x_2, y_2)$$

$$U + V = (x_1 + x_2, y_1 + y_2)$$

$$L(U+V) = L(x_1 + x_2, y_1 + y_2)$$

$$L(U+V) = (x_1 + x_2 + 1, y_1 + y_2, x_1 + x_2 + y_1 + y_2)$$

Given that $u = (x + 2y)$

$$L(u) = L(x_1, y_1) = (x+1+y+, x_1 + y - 1)$$

$$L(u) = L(x_2, y_2) = (x_2 + 1, y_2, x_2 + y_2)$$

$$L(u) + L(v) = (x_1 + x_2 + 2, y_1 + y_2, x_1 + x_2 + y_2 + y_2)$$

Since $1 \neq 2$. //

Q3 using matrix $A = \begin{bmatrix} 1 & 2 & 3 \\ 1 & 1 & 2 \\ 0 & 1 & 2 \end{bmatrix}$ .... decode the message 77 54 38 71

..... 53 52.

a) Coad the message "send him money".

(b) decode the message. 67 44 41 49 39 113 76 62 104

69 55.

(a) Send him money

19 5 14 4 8 9 13 13 15 14 5 25.

(b) De code the message.

77 54 38 71 49 29 68 51 33 76 48 40 86, 53 52

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

for de coading the A^{-1} is most.

$$A^{-1} = \frac{\text{adj } A}{|A|}$$

$$A^{-1} = \begin{bmatrix} 0 & 1 & -1 \\ 2 & -2 & -1 \\ -1 & 1 & -1 \end{bmatrix}$$

$$x_5 = \begin{bmatrix} 88 \\ 53 \\ 52 \end{bmatrix} \quad x_1 = \begin{bmatrix} 77 \\ 54 \\ 38 \end{bmatrix}, x_2 \begin{bmatrix} 71 \\ 49 \\ 29 \end{bmatrix}, x_3 \begin{bmatrix} 68 \\ 51 \\ 33 \end{bmatrix} \quad x_4 = \begin{bmatrix} 76 \\ 48 \\ 40 \end{bmatrix}$$

$$A^{-1} x_1 = \begin{bmatrix} 0 & 1 & -1 \\ 2 & -2 & -1 \\ -1 & 1 & 1 \end{bmatrix} \begin{bmatrix} 77 \\ 54 \\ 38 \end{bmatrix} = \begin{bmatrix} 16 \\ 8 \\ 15 \end{bmatrix}$$

$$A^{-1} x_2 = \begin{bmatrix} \quad 11 \quad \end{bmatrix} \begin{bmatrix} 71 \\ 49 \\ 29 \end{bmatrix} = \begin{bmatrix} 20 \\ 15 \\ 7 \end{bmatrix}$$

P.T.O.

$$A^{-1}x_3 = \begin{bmatrix} 0 & 1 & -1 \\ 2 & -2 & -1 \\ -1 & 1 & 1 \end{bmatrix} \begin{bmatrix} 62 \\ 51 \\ 73 \end{bmatrix} = \begin{bmatrix} 18 \\ 1 \\ 15 \end{bmatrix}$$

$$Ax_4 = \begin{bmatrix} 0 & 1 & -1 \\ 2 & -2 & -1 \\ -1 & 1 & 1 \end{bmatrix} \begin{bmatrix} 76 \\ 48 \\ 40 \end{bmatrix} = \begin{bmatrix} 8 \\ 16 \\ 12 \end{bmatrix}$$

$$Ax_5 = \begin{bmatrix} 0 & 1 & -1 \\ 2 & -2 & -1 \\ -1 & 1 & 1 \end{bmatrix} \begin{bmatrix} 86 \\ 53 \\ 52 \end{bmatrix} = \begin{bmatrix} 1 \\ 14 \\ 19 \end{bmatrix}$$

A . B C D E F ....   W, X, Y Z.
1 2 3 4 5 6   23 24 25 26

Talha $\longrightarrow$ Umar

$$A = \begin{bmatrix} 1 & 2 & 3 \\ 1 & 1 & 2 \\ 0 & 1 & 2 \end{bmatrix}.$$

m = 15. e = 5, e = 5, t = 20, t = 20

o = 15, m = 13, o = 15, r = 18, r = 18

o = 15 w = 23.

$$x_1 = \begin{bmatrix} 15 \\ 5 \\ 5 \end{bmatrix}, \quad x_2 = \begin{bmatrix} 20 \\ 20 \\ 15 \end{bmatrix} \quad x_3 = \begin{bmatrix} 13 \\ 15 \\ 18 \end{bmatrix}, \quad x_4 = \begin{bmatrix} 18 \\ 15 \\ 23 \end{bmatrix}$$

$$Ax_1 = \begin{bmatrix} 1 & 2 & 3 \\ 1 & 1 & 2 \\ 0 & 1 & 2 \end{bmatrix} \begin{bmatrix} 15 \\ 5 \\ 5 \end{bmatrix} = \begin{bmatrix} 38 \\ 28 \\ 15 \end{bmatrix}$$

$$Ax_2 = \begin{bmatrix} 1 & 2 & 3 \\ 1 & 1 & 2 \\ 0 & 1 & 2 \end{bmatrix} \begin{bmatrix} 20 \\ 20 \\ 15 \end{bmatrix} = \begin{bmatrix} 105 \\ 70 \\ 50 \end{bmatrix}$$

$$Ax_3 \begin{bmatrix} & // & \end{bmatrix} \begin{bmatrix} 13 \\ 15 \\ 18 \end{bmatrix} = \begin{bmatrix} 97 \\ 64 \\ 51 \end{bmatrix}$$

P.T.O.

$$A_{x_4} = \begin{bmatrix} 1 & 2 & 3 \\ 1 & 1 & 2 \\ 0 & 1 & 2 \end{bmatrix} \begin{bmatrix} 18 \\ 15 \\ 23 \end{bmatrix} = \begin{bmatrix} 119 \\ 79 \\ 61 \end{bmatrix}$$

So Talha send the message

38. 28 15 105 70 50 97 64 51 119 74 //

Q4// Find an equation of the Plane Passing Through the Point $(-1, 3, 2)$ & Perpendicular to the vector $n = (0, 1, -3)$

$(-1, 3, 2)$ $n = (0, 1, -3)$

Solution:

Equ of Plane.

~~$a(x - x_0) + b(y - y_0\ z_0) = (-1, 3, 2)$~~

$a = (x - x_0) + b(y - y_0) + c(z - z_0) = 0$

Given data:

$p = (x_0, y_0, z_0) = (-1, 3, 2)$

$n = (a, b, c) = (0, 1, -3)$

So, $0(x - (-1)) + 1(y - 3) - 3(z - 2)$

$\underbrace{0(x+1)}_{\downarrow} + 1(y-3) - 3(z-2)$

$0 + y - 3 - 3z + 6$

$\Rightarrow y - 3z - 3 + 0$

$\Rightarrow y - 3z + 3$ // Ans.

Q5// Find an Eigen values & Eigen vector of matrix $A = \begin{bmatrix} 1 & 1 \\ -2 & 4 \end{bmatrix}$.

Sol..

Since we know that

$$Ax = \lambda x$$

$$\begin{bmatrix} 1 & 1 \\ -2 & 4 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \lambda \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$$

$$\begin{bmatrix} x_1 + x_2 \\ -2x_1 + 4x_2 \end{bmatrix} = \begin{bmatrix} \lambda x_1 \\ \lambda x_2 \end{bmatrix}$$

When

$$m + x_2 = \lambda x_1 \rightarrow ①$$

$$\text{If } A_1 = \begin{bmatrix} 1 & -1 \\ 0 & 3 \end{bmatrix}$$

$$A_2 = \begin{bmatrix} 1 & 1 \\ 0 & 2 \end{bmatrix}$$

$$A_3 = \begin{bmatrix} 2 & 2 \\ -1 & 1 \end{bmatrix}$$

$A = \begin{bmatrix} 5 & 1 \\ -1 & 9 \end{bmatrix}$ is c.c of A_1, A_2, A_3 //