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(Q1)

Sol:

let $A = \left(\begin{array}{ccc|c} 1 & -3 & 4 & -2 \\ 3 & -7 & 7 & -9 \\ -4 & 6 & -1 & 9 \end{array}\right)$

Now

$A = \left(\begin{array}{ccc|c} 1 & -3 & 4 & -2 \\ 0 & 2 & -5 & -3 \\ 0 & -6 & 15 & 1 \end{array}\right)$

$R2 - 3R_1$

$R3 + 4R_1$

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$$R_3 \rightarrow \left[\begin{array}{ccc|c} 1 & -3 & 4 & -2 \\ 0 & 2 & -5 & -3 \\ 6 & 0 & 0 & 8 \end{array}\right]$$

$R_3 + 3R_2$

Now

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

$$0x + 2y - 5z = -3$$

$$0x + 0y + 0z = 8$$

$$x - 3y + 4z = -2 \quad (i)$$

$$0x + 2y - 5z = -3 \quad (ii)$$

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$0x + 0y + 0 \cdot 2 = 8$ (iii)

put z in (ii)

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

$+2y - 5(8) = -3$

$2y - 40 = -3$

$2y = -3 - 40$

$y = \frac{-3 - 40}{2}$

$y = 18.5$

put y in (i)

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$x - 3(18.5) + 4(8) = -2$

$x - 55.5 + 32 = -2$

$x = 155.5 - 32 - 2$

$x = \boxed{21.5}$

$\boxed{x = 21.5}$ $\boxed{y = 18.5}$

$\boxed{z = 8}$

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Question No. 2 :

a) :

Solution :

Find inverse

$$\begin{bmatrix} ID3 & -1 & 0 \\ 0 & 1 & ID3 \\ 1 & 1 & 0 \end{bmatrix}$$

Now $A = \begin{bmatrix} 9 & -1 & 0 \\ 0 & 1 & 9 \\ 1 & 1 & 0 \end{bmatrix}$

$$R: \left[\begin{array}{ccc|ccc} 1 & 1 & 0 & 1 & 0 & 0 \\ 0 & 1 & 9 & 0 & 1 & 0 \\ 9 & -1 & 0 & 0 & 0 & 1 \end{array}\right]$$

$R_1 \leftrightarrow R_3$

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$$R_2 \leftrightarrow R_3$$

$$\left[\begin{array}{ccc|ccc} 1 & 1 & 0 & 0 & 0 & 1 \\ 9 & -1 & 0 & 1 & 0 & 0 \\ 0 & 1 & 9 & 0 & 1 & 0 \end{array}\right]$$

$$R_2 - 9R_1$$

$$\left[\begin{array}{ccc|ccc} 1 & 1 & 0 & 0 & 0 & 1 \\ 0 & -9 & 0 & 1 & 0 & 0 \\ 0 & 1 & 9 & 0 & 1 & 0 \end{array}\right]$$

$$-\frac{1}{9} R_2$$

$$\left[\begin{array}{ccc|ccc} 1 & 1 & 0 & 0 & 0 & 1 \\ 0 & 1 & 0 & -1/9 & 0 & 0 \\ 0 & 1 & 9 & 0 & 1 & 0 \end{array}\right]$$

$$R_3 - R_2$$

$$\left[\begin{array}{ccc|ccc} 1 & 1 & 0 & 0 & 0 & 1 \\ 0 & 1 & 0 & -1/9 & 0 & 0 \\ 0 & 0 & 9 & 1/9 & 1 & 0 \end{array}\right]$$

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$$\left[\begin{array}{ccc|ccc} 1 & 1 & 0 & 0 & 0 & 1 \\ 0 & 1 & 0 & 1/9 & 0 & 0 \\ 0 & 0 & 9 & 1 & 1/9 & 0 \end{array}\right] \quad \frac{1}{9} R_3$$

$$\left[\begin{array}{ccc|ccc} 1 & 0 & 0 & 0 & 0 & 3 \\ 0 & 1 & 0 & 1/9 & 0 & 0 \\ 0 & 0 & 1 & 1 & 1/9 & 0 \end{array}\right] \quad R_1 - R_2$$

$$\left[\begin{array}{ccc} 0 & 0 & 1 \\ 1/9 & 0 & 0 \\ 1 & 1/9 & 0 \end{array}\right] \rightarrow \text{Ans}$$

Inverse of the matrix

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Question 2: P

b): i Question 2 (B)

let $A = \begin{pmatrix} 1 & 10_3 & 8 \\ 2 & 10_4 & -1 \\ -3 & 0 & 0 \\ 1 & -10_3 & 16 \end{pmatrix}$

Sol

$A = \begin{pmatrix} 1 & 9 & 8 \\ 2 & 9 & -1 \\ -3 & 0 & 0 \\ -1 & 9 & 16 \end{pmatrix}$

$A \sim \left(\begin{array}{ccc|l} 1 & 9 & 8 & \\ 0 & 9 & -17 & R_2 - 2R_1 \\ 0 & 12 & 11 & R_3 + 3R_1 \\ 0 & 18 & 24 & R_4 + R_1 \end{array}\right)$

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$$\sim \begin{bmatrix} 1 & 9 & 8 \\ 0 & 9 & -17 \\ 0 & 0 & 102 \\ 0 & 18 & 24 \end{bmatrix} \quad 3R_3 - 4R_2$$

$$\sim \begin{bmatrix} 1 & 9 & 8 \\ 0 & 9 & -17 \\ 0 & 0 & 102 \\ 0 & 0 & 34 \end{bmatrix} \quad R_4 - 2R_2$$

Ans.

it can not be further solved because of 34 that can not be zero.

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Q3:)

Solution:

$$\begin{bmatrix} 103 & -6 & 2 \\ -6 & 102 & -4 \\ 2 & -4 & 104 \end{bmatrix}$$

putting the values of ID

$$\begin{bmatrix} 9 & -6 & 2 \\ -6 & 2 & -4 \\ 2 & -4 & 9 \end{bmatrix}$$

For eigen value

let $(A - \lambda I)$

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$$\Rightarrow \begin{vmatrix} 9 & -6 & 2 \\ -6 & 2 & -4 \\ 2 & -4 & 9 \end{vmatrix} - \lambda \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

$$\Rightarrow \begin{vmatrix} 9 & -6 & 2 \\ -6 & 2 & -4 \\ 2 & -4 & 9 \end{vmatrix} - \begin{bmatrix} +\lambda & 0 & 0 \\ 0 & +\lambda & 0 \\ 0 & 0 & +\lambda \end{bmatrix}$$

$$\Rightarrow \begin{vmatrix} 9-\lambda & -6 & 2 \\ -6 & 2-\lambda & -4 \\ 2 & -4 & 9-\lambda \end{vmatrix}$$

Now find $\det(A - \lambda I) = 0$

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$$= \begin{vmatrix} 9-\lambda & -6 & 2 \\ -6 & 2-\lambda & -4 \\ 2 & -4 & 9-\lambda \end{vmatrix} = 0$$

$$= (9-\lambda)\left[(2-\lambda)(9-\lambda)-16\right] + 6\left[(-6)(9-\lambda)+8\right]$$

$$+ 2\left[24 - 2(2-\lambda)\right] = 0$$

$$\Rightarrow (9-\lambda)\left[18 - 9\lambda - 2\lambda + \lambda^2 - 16\right] + 6\left[-54 + 6\lambda + 8\right]$$

$$+ 2\left[24 - 4 + 2\lambda\right] = 0$$

$$\Rightarrow (9-\lambda)\left[\lambda^2 - 11\lambda + 2\right] + 6\left[6\lambda - 46\right] + 2\left[2\lambda + 20\right] = 0$$

$$\Rightarrow 9\lambda^2 - 99\lambda + 18 - \lambda^3 + 11\lambda^2 - 2\lambda + 36\lambda - 276 + 4\lambda + 40$$

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2) $-\lambda^3 + 20\lambda^2 - 61\lambda - 21 = 0$

By using Synthetic Division

by putting $\lambda = -2$ we have

$$-(-2)^3 + 20(-2)^2 - 61(-2) - 210 = 0$$

$$8 + 80 + 122 - 210 = 0$$

$$0 = 0$$

Hence factor is 2

2	-1	20	-61	-210
		+2	-44	+210
		22	-15	0
	-1			

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$$(t-2)(-t^2+22t-105)=0$$

$$t=2 \quad | \quad -t^2-22t-105=0$$

$$\frac{-b \pm \sqrt{b^2-4ac}}{2a}$$

$$= \frac{22 \pm \sqrt{(22)^2-4(-1)(-105)}}{(-2)}$$

$$= \frac{22 \pm \sqrt{484-420}}{-2}$$

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$$= \frac{22 \pm \sqrt{64}}{-2}$$

$$\Rightarrow \frac{22 \pm 8}{-2}$$

$$\frac{22+8}{-2} \qquad \frac{22-8}{-2}$$

$$\frac{30}{-2} \qquad \frac{14}{-2}$$

$$r = -15 \qquad d = -7$$

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value is

$$t = 2, -5, -7$$

Ans.