

Name : irfan ullah

ID : 15431

Subject : linear aljabra

Program : BC (CS)

Q1

$$\left[\begin{array}{cccc|c} 1 & -3 & 4 & 1 & 1 \\ 3 & -7 & 7 & 8 & \\ 4 & 6 & -1 & 5 & \end{array} \right] \begin{array}{l} R_2 - 3R_1 \\ R_3 - 4R_1 \end{array}$$

$$\left[\begin{array}{cccc|c} 1 & -3 & 4 & 1 & 1 \\ 0 & 2 & -5 & 5 & \\ 0 & 6 & -1 & 5 & \end{array} \right] 6R_2 - 2R_3$$

$$\left[\begin{array}{cccc|c} 1 & -3 & 4 & 1 & 1 \\ 0 & 0 & 4 & 2 & \\ 0 & 6 & -17 & 1 & \end{array} \right] \frac{1}{4}R_2$$

$$\left[\begin{array}{cccc|c} 1 & -3 & 4 & 1 & 1 \\ 0 & 0 & 1 & \frac{1}{2} & \\ 0 & 6 & -17 & 1 & \end{array} \right]$$

Exchang R_3 to Row (2)

$$\left[\begin{array}{cccc|c} 1 & -3 & 4 & 1 & 1 \\ 0 & 6 & -17 & 1 & \\ 0 & 0 & 1 & \frac{1}{2} & \end{array} \right]$$

Q

Q2(a)

$$\begin{bmatrix} 103 & -1 & 0 \\ 0 & 1 & 103 \\ 1 & 1 & 0 \end{bmatrix}$$

$$\begin{bmatrix} 95 & -1 & 0 \\ 0 & 1 & 59 \\ 1 & 1 & 0 \end{bmatrix}$$

$$\begin{aligned} |A| &= 5((1)(0) - (5)(1)) - (-1)(0 - 5) + 0(0 - 1) \\ &= 5(-5) + 1(-5 + 0(-1)) \\ &= -25 - 5 + 0 \end{aligned}$$

$$|A| = -30$$

$$A_{11} = (-1)^{1+1} \begin{vmatrix} 1 & 5 \\ 1 & 0 \end{vmatrix} = (-1)^2(-5) = -5$$

$$A_{12} = (-1)^{1+2} \begin{vmatrix} 0 & 5 \\ 1 & 0 \end{vmatrix} = (-1)(-5) = +5$$

$$A_{13} = (1)(-1) = -1$$

$$A_{21} = (0)$$

$$A_{22} = (0)$$

$$A_{23} = (-1) \begin{vmatrix} 5 & -1 \\ 1 & 1 \end{vmatrix} = (-1)(5+1) = -6$$

$$A_{31} = (+5)$$

$$A_{32} = (-25)$$

$$A_{33} = (5)$$

$$\begin{pmatrix} -5 & +5 & -1 \\ 0 & 0 & -6 \\ 5 & -25 & 5 \end{pmatrix}$$

$$\text{Adj}(A) = \begin{pmatrix} -5 & 0 & 5 \\ 5 & 0 & -25 \\ -1 & -6 & 5 \end{pmatrix}$$

$$A^{-1} = \frac{1}{|A|} \text{Adj}(A)$$

$$A^{-1} = \frac{1}{30} \begin{pmatrix} -5 & 0 & 5 \\ 5 & 0 & -25 \\ -1 & -6 & 5 \end{pmatrix}$$

$$A^{-1} = \begin{pmatrix} -5/30 & 0 & 5/30 \\ 5/30 & 0 & -25/30 \\ -1/30 & -6/30 & 5/30 \end{pmatrix}$$

$$A^{-1} = \begin{pmatrix} -1/6 & 0 & 1/6 \\ 1/6 & 0 & -5/6 \\ -1/30 & -1/5 & 1/6 \end{pmatrix}$$

Qo Part (0)

$$\begin{bmatrix} 1 & 5 & 8 \\ 2 & -2 & 17 \\ 0 & 15 & 24 \\ 0 & -10 & 8 \end{bmatrix}$$

$$\begin{bmatrix} 1 & 5 & 8 \\ 2 & -2 & 17 \\ 0 & 15 & 24 \\ 0 & -10 & 8 \end{bmatrix} \begin{array}{l} R_2 - 2R_1 \quad -2 - 10 = -12 \\ R_3 + 3R_1 \quad 2 \quad 8 = 10 \\ R_4 - R_1 \quad 0 - 2 = -2 \end{array}$$

common 3 from Row (3)

$$\begin{bmatrix} 1 & 5 & 8 \\ 0 & -2 & 17 \\ 0 & 5 & 8 \\ 0 & 10 & 8 \end{bmatrix} \begin{array}{l} \div \text{divided Row (2)} \\ \begin{array}{l} 3 \quad 15 \quad 24 \\ -3 \quad 0 \quad 0 \\ 0 \quad 15 \quad 24 \end{array} \end{array}$$

$$\begin{bmatrix} 1 & 5 & 8 \\ 0 & -1 & 17/2 \\ 0 & 5 & 8 \\ 0 & -10 & 8 \end{bmatrix} \begin{array}{l} R_3 + 5R_2 \quad \begin{array}{l} 1 \quad 5 \quad 16 \\ -1 \quad -5 \quad -18 \\ 2 \quad -10 \quad 8 \end{array} \end{array}$$

$$\begin{bmatrix} 1 & 5 & 8 \\ 0 & -1 & 17/2 \\ 0 & 0 & 10 1/2 \\ 0 & 0 & 20/2 \end{bmatrix}$$

$$\begin{bmatrix} 1 & 5 & 8 \\ 0 & -1 & 17/2 \\ 0 & 0 & 10 1/2 \\ 0 & 0 & 0 \end{bmatrix}$$

Q3

$$\begin{bmatrix} 5 & -6 & 2 \\ -6 & 4 & -4 \\ 2 & -4 & 8 \end{bmatrix}$$

$$A - \lambda I = \begin{bmatrix} 5 & -6 & 2 \\ -6 & 4 & -4 \\ 2 & -4 & 8 \end{bmatrix} - \lambda \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

$$= \begin{bmatrix} 5-\lambda & -6 & 2 \\ -6 & 4-\lambda & -4 \\ 2 & -4 & 8-\lambda \end{bmatrix}$$

$$(5-\lambda) \begin{vmatrix} 4-\lambda & -4 \\ -4 & 8-\lambda \end{vmatrix} + 6 \begin{vmatrix} -6 & -4 \\ 2 & 8-\lambda \end{vmatrix} + 2 \begin{vmatrix} -6 & 4-\lambda \\ 2 & -4 \end{vmatrix}$$

$$= [(5-\lambda)(4-\lambda)(8-\lambda) - 16] + 6(-6(8-\lambda) + 8)$$

$$+ 2(24 - 2(4\lambda - 8))$$

$$= (5-\lambda)(32 - 4\lambda - 8\lambda + \lambda^2 - 16) + 6(-48$$

$$+ 6\lambda + 8) + 2(24 - 2\lambda - 8)$$

$$= (5-\lambda)(16 - 12\lambda + \lambda^2) + 6(-56 + 6\lambda)$$

$$+ 2(16 - 2\lambda)$$

$$= (80 - 60\lambda + 5\lambda^2 - 16\lambda + 19\lambda^2 - \lambda^3) - 336 + 36\lambda + 39 - 4\lambda$$

$$= -\lambda^3 + 17\lambda^2 - 44\lambda + 998 = 0$$

$$-\lambda^3 + 17\lambda^2 - 44\lambda + 994 = 0$$

$$\lambda^3 - 17\lambda^2 + 44\lambda = -994$$

~~$$\lambda^3 - 17\lambda^2 + 44\lambda = -994$$~~

$$\lambda = -994$$

$$\lambda^2 - 17\lambda + 44 = 0$$

$$|A - \lambda I| = 0$$

$$\left[\begin{array}{ccc|c} 5 & -6 & 2 & x \\ -6 & 4 & -4 & y \\ 2 & -4 & 8 & z \end{array} \right] = \begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix}$$

$$5x - 6y + 2z = 0$$

$$-6x + 4y - 4z = 0$$

$$2x - 4y + 8z = 0$$

$$\frac{x}{24-14} = \frac{y}{-16+39} = \frac{z}{56-36}$$

$$\frac{x}{10} = \frac{y}{16} = \frac{z}{20}$$

$$\frac{x}{5} = \frac{y}{8} = \frac{z}{10}$$

Ans