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Paper Linear Algebra.

Q1 (a)

Sol:: Calculate the (3, 2) Entry of AB.

Say $AB = C$, (3, 2) entry as C_{32} as $Row_3(A)$. $Col_2(B)$

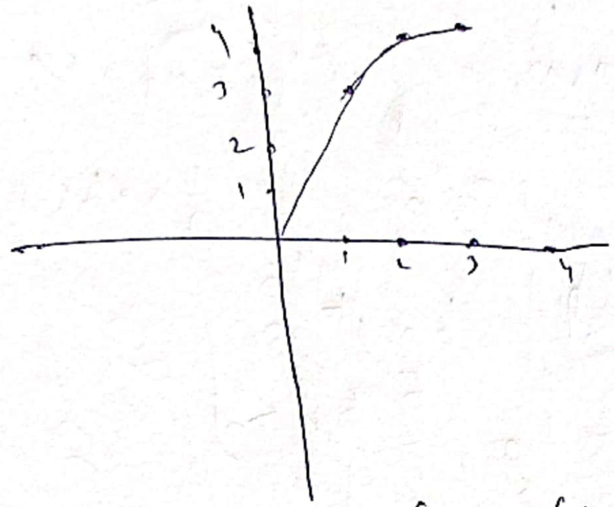
$$Row_3(A) \cdot Col_2(B) = \begin{bmatrix} 0 & 1 & -2 \end{bmatrix} \cdot \begin{bmatrix} 4 \\ -1 \\ 2 \end{bmatrix}$$

$= -5$

②

Q 1 (b)

Sol: Label The Quadretic Polynomial.



Suppose $P(x) = f(1)\frac{(x-2)(x-3)}{(1-2)(1-3)} + f(2)\left(\frac{(x-1)(x-3)}{(2-1)(2-3)}\right)$

$+ f(3)\frac{(x-1)(x-2)}{(3-1)(3-2)}$

(a) $P(x) = ax^2+bx+c$.

Use the Quadretic formula to

(b) find to find the roots of $P(x)$.

(c) Using the above calculation find P_3 of Muller Method on $f(x)$ when $P_0 = 1$, $P_1 = 2$ $P_2 = 3$

Q2 (a)

A and B are nxn Matrix

This Mean they are equal by order-

$|A| = 2$ and $|B| = -3$

So $A = \begin{bmatrix} 2 & 2 \\ 1 & 2 \end{bmatrix}$ $B = \begin{bmatrix} 2 & 7 \\ 1 & 2 \end{bmatrix}$

calculate $|A^{-1} B^T|$

$$A^{-1} = \frac{Adj\,A}{|A|}$$

$Adj\,A = \begin{bmatrix} 2 & -1 \\ -2 & 2 \end{bmatrix}$ $|A| = 2$

$$A^{-1} = \frac{1}{2}\begin{bmatrix} 2 & -1 \\ -2 & 2 \end{bmatrix} \Rightarrow \begin{pmatrix} 1 & -\frac{1}{2} \\ -1 & 1 \end{pmatrix}$$

$$A^{-1} = \begin{bmatrix} 1 & 0.5 \\ -1 & 1 \end{bmatrix}$$

$$B^T = \begin{bmatrix} 2 & 1 \\ 7 & 2 \end{bmatrix}$$

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$$A^{-1}B^T = \begin{bmatrix} 1 & 0.5 \\ -1 & 1 \end{bmatrix} \begin{bmatrix} 2 & 1 \\ 7 & 2 \end{bmatrix}$$

$$= \begin{bmatrix} 2+3.5 & 1+1 \\ -2+7 & -1+2 \end{bmatrix}$$

$$A^{-1}B^T = \begin{bmatrix} 5.5 & 2 \\ 5 & 1 \end{bmatrix}$$

$$|A^{-1}BT| = \begin{vmatrix} 5.5 & 2 \\ 5 & 1 \end{vmatrix}$$

$$= (5.5 \times 1) - (5 \times 2))$$

$$= (5.5 - 10) = -5.5$$

$$|A^{-1}BT| = -5.5.$$

Q 2 (b)

$x + y + 2z = 1$

$x - 2y + z = -5$

$3x + y + z = 3$

$$A = \begin{bmatrix} 1 & 1 & 2 \\ 1 & -2 & 1 \\ 3 & 1 & 1 \end{bmatrix} \quad X = \begin{bmatrix} x \\ y \\ z \end{bmatrix} \quad B = \begin{bmatrix} 1 \\ -5 \\ 3 \end{bmatrix}$$

$$Ax = B$$

$$X = A^{-1}B$$

Now

$$A^{-1} = ? \qquad A^{-1} = \frac{\text{Adj}\,A}{|A|}$$

$$|A| = 14$$

$\text{Adj}\,A = ?$

$$A_{11} = (-1)^{1+1} \begin{vmatrix} -2 & 1 \\ 1 & 1 \end{vmatrix} = -2 - 1 = -3$$

$$A_{12} = (-1)^{1+2} \begin{vmatrix} 1 & 1 \\ 3 & 1 \end{vmatrix} = -(1 - 3) = 2$$

$$A_{13} = (-1)^{1+3} \begin{vmatrix} 1 & -2 \\ 3 & 1 \end{vmatrix} = 1 + 6 = 7$$

6

$$A_{21} = (-1)^{2+1} \begin{vmatrix} 1 & 2 \\ 1 & 1 \end{vmatrix} = 1$$

$$A_{22} = (-1)^{2+2} \begin{vmatrix} 1 & 2 \\ 3 & 1 \end{vmatrix} = -5$$

$$A_{23} = (-1)^{2+3} \begin{vmatrix} 1 & 1 \\ 3 & 1 \end{vmatrix} = +2$$

$$A_{31} = (-1)^{3+1} \begin{vmatrix} 1 & 2 \\ -2 & 1 \end{vmatrix} = 5$$

$$A_{32} = (-1)^{3+2} \begin{vmatrix} 1 & 2 \\ 1 & 1 \end{vmatrix} = +1$$

$$A_{33} = (-1)^{3+3} \begin{vmatrix} 1 & 1 \\ 1 & -2 \end{vmatrix} = -3$$

$$A^{-1} = \frac{\cancel{\operatorname{Adj} A}}{\cancel{|A|}} = \begin{vmatrix} -3 & 2 & 7 \\ 1 & -5 & 2 \\ 5 & 1 & -3 \end{vmatrix}$$

$$X = A^{-1} B$$

$$X = \frac{1}{14} \begin{bmatrix} -3 & 2 & 7 \\ 1 & -5 & 2 \\ 5 & 1 & -3 \end{bmatrix} \begin{bmatrix} 1 \\ -5 \\ 3 \end{bmatrix}$$

$$X = \frac{1}{14} \begin{bmatrix} -3 - 10 + 21 \\ 1 + 25 + 6 \\ 5 - 5 - 9 \end{bmatrix} \Rightarrow \frac{1}{14} \begin{bmatrix} 8 \\ 32 \\ -9 \end{bmatrix}$$

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$$X = \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} \frac{8}{14} \\ \frac{32}{14} \\ \frac{-9}{14} \end{bmatrix}$$

$$X = 8/14 = 4/7$$

$$Y = \frac{32}{14} = 16/7$$

$$Z = -9/14 = -9/14$$

x ——————————— x

Q:3

Find A^{-1} where $A = \begin{bmatrix} 3 & -2 & 1 \\ 5 & 6 & 2 \\ 1 & 0 & 3 \end{bmatrix}$

Sol: $|A| = \begin{vmatrix} 3 & -2 & 1 \\ 5 & 6 & 2 \\ 1 & 0 & 3 \end{vmatrix}$

$= 3\begin{vmatrix} 6 & 2 \\ 0 & 3 \end{vmatrix} + 2\begin{vmatrix} 5 & 2 \\ 1 & 3 \end{vmatrix} + 1\begin{vmatrix} 5 & 6 \\ 1 & 0 \end{vmatrix}$

$= 3(-4-6) + 2(-15-2) + 1(0-6)$

$= |A| = -94$

Now $A_{11} = (-1)^{1+1}\begin{vmatrix} 6 & 2 \\ 0 & 3 \end{vmatrix} = -18$

$A_{12} = (-1)^{1+2}\begin{vmatrix} 5 & 2 \\ 1 & -3 \end{vmatrix} = 17$

$A_{13} = (-1)^{1+3}\begin{vmatrix} 5 & 6 \\ 1 & 0 \end{vmatrix} = -6$

$A_{21} = (-1)^{2+1}\begin{vmatrix} -2 & 1 \\ 0 & -3 \end{vmatrix} = -6$

$A_{22} = (-1)^{2+2}\begin{vmatrix} 3 & 1 \\ 1 & -3 \end{vmatrix} = -10$

$A_{23} = (-1)^{2+3}\begin{vmatrix} 3 & -2 \\ 1 & 0 \end{vmatrix} = -2$

$A_{31} = (-1)^{3+1}\begin{vmatrix} -2 & 1 \\ 0 & 2 \end{vmatrix} = -10$

$A_{32} = (-1)^{3+3}\begin{vmatrix} 3 & 1 \\ 5 & 2 \end{vmatrix} = -1$

$A_{33} = (-1)^{3+3}\begin{vmatrix} 3 & -2 \\ 5 & 6 \end{vmatrix} = 28$

$$\operatorname{Adj} A = \begin{bmatrix} A_{11} & A_{12} & A_{13} \\ A_{21} & A_{22} & A_{23} \\ A_{31} & A_{32} & A_{33} \end{bmatrix}^t$$

$$= \begin{vmatrix} A_{11} & A_{21} & A_{31} \\ A_{12} & A_{22} & A_{32} \\ A_{13} & A_{23} & A_{33} \end{vmatrix}$$

$$A^{-1} = \frac{1}{|A|} \operatorname{Adj} A$$

$$A^{-1} = \frac{1}{-94} \begin{vmatrix} 18 & 6 & 10 \\ -17 & 10 & 1 \\ 6 & 2 & -28 \end{vmatrix}$$

The end