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

1. LEAD 0 IS MAX FOR COL 1
2. ANNIHILATE S.D COL 1 ENTRIES

$$\begin{bmatrix} 1 & 0 & 0 \\ 1/5 & 1 & 0 \\ 3/5 & 0 & 1 \end{bmatrix} \begin{bmatrix} -5 & 2 & -1 \\ 1 & 0 & 3 \\ 3 & 1 & 6 \end{bmatrix} = \begin{bmatrix} -5 & 2 & -1 \\ 0 & 2/5 & 14/5 \\ 0 & 11/5 & 29/5 \end{bmatrix}$$

$M_1 P_1$ $\quad A \quad$ $M_1 P_1 A$

3. GET MAX IN COL 2 TO DIA

$$\begin{bmatrix} 1 & 0 & 0 \\ 0 & 0 & 1 \\ 0 & 1 & 0 \end{bmatrix} \begin{bmatrix} -5 & 2 & -1 \\ 0 & 2/5 & 14/5 \\ 0 & 11/5 & 29/5 \end{bmatrix} = \begin{bmatrix} -5 & 2 & -1 \\ 0 & 11/5 & 29/5 \\ 0 & 2/5 & 14/5 \end{bmatrix}$$

P_2 $\quad M_1 P_1 A$

4. ANNIHILATE S.D ENTRIES IN COL 2

$$\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & -2/11 & 1 \end{bmatrix} \begin{bmatrix} -5 & 2 & -1 \\ 0 & 11/5 & 29/5 \\ 0 & 2/5 & 14/5 \end{bmatrix} = \begin{bmatrix} -5 & 2 & -1 \\ 0 & 11/5 & 29/5 \\ 0 & 0 & 20/11 \end{bmatrix} = U$$

M_2 $\quad P_2 M_1 P_1 A \quad$ $M_2 P_2 M_1 P_1 A$

$$-\frac{2}{11} \cdot \frac{11}{5} = -\frac{2}{5}$$

$$-\frac{2}{5} + \frac{2}{5} = 0 \quad \checkmark$$

$$-\frac{2}{11} \cdot \frac{29}{5} = -\frac{54}{55} \rightarrow -\frac{54}{55} + \frac{14}{5} \rightarrow -\frac{54}{55} + \frac{154}{55} = \frac{100}{55} = \frac{20}{11}$$

5. DETERMINE NON-UP. TRI $\hat{L}$ IN

$$U = A$$

$$= (M_2 P_2 M_1 P_1)^{-1} = P_1^T L_1 P_2^T L_2$$

$$P_1 = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

$$L_2 = M_2^{-1} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 2/11 & 1 \end{bmatrix}$$

$$P_2 = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 0 & 1 \\ 0 & 1 & 0 \end{bmatrix}$$

$$P_2^T = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 0 & 1 \\ 0 & 1 & 0 \end{bmatrix}$$

$$L_1 = M_1^{-1} = \begin{bmatrix} 1 & 0 & 0 \\ 1/5 & 1 & 0 \\ 3/5 & 0 & 1 \end{bmatrix}$$

$P_2 M_1 P_1 A$

$$P_2 P_1 = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 0 & 1 \\ 0 & 1 & 0 \end{bmatrix} = P \rightarrow PA = LU$$

$$\hat{L} = P_2 P_1 \hat{L} = P_2 \hat{L} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 0 & 1 \\ 0 & 1 & 0 \end{bmatrix} \begin{bmatrix} 1 & 0 & 0 \\ -1/5 & 2/11 & 1 \\ -3/5 & 1 & 0 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 \\ -1/5 & 1 & 0 \\ -3/5 & 2/11 & 1 \end{bmatrix}$$

$$PA = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 0 & 1 \\ 0 & 1 & 0 \end{bmatrix} \begin{bmatrix} -5 & 2 & -1 \\ 1 & 0 & 3 \\ 3 & 1 & 6 \end{bmatrix} = \begin{bmatrix} -5 & 2 & -1 \\ 3 & 1 & 6 \\ 1 & 0 & 3 \end{bmatrix}$$

$$LU = \begin{bmatrix} 1 & 0 & 0 \\ -1/5 & 1 & 0 \\ -3/5 & 2/11 & 1 \end{bmatrix} \begin{bmatrix} -5 & 2 & -1 \\ 0 & 11/5 & 29/5 \\ 0 & 0 & 20/11 \end{bmatrix}$$

$$= \begin{bmatrix} -5 & 2 & -1 \\ 3 & 1 & 6 \\ 1 & 0 & 3 \end{bmatrix} = PA \quad \checkmark$$

$$-\frac{3}{5} \cdot 2 + \frac{11}{5} = -\frac{6}{5} + \frac{11}{5}$$

$$\frac{1}{5} + \frac{29}{5} = 6$$

$$-\frac{1}{5} \cdot 2 + \frac{2}{5} = 0$$

$$\frac{1}{5} + \frac{2}{11} \cdot \frac{29}{5} + \frac{20}{11}$$

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