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Q3) option 2:

a)

$$A = \begin{bmatrix} 1 & 1 & 2 \\ 2 & 2 & 7 \\ 3 & 5 & 8 \end{bmatrix} \xrightarrow{P_{13}} \begin{bmatrix} 3 & 5 & 8 \\ 2 & 2 & 7 \\ 1 & 1 & 2 \end{bmatrix} \xrightarrow{\substack{-\frac{2}{3} R_1 \to R_2 \\ -\frac{1}{3} R_1 \to R_3}} \begin{bmatrix} 3 & 5 & 8 \\ 0 & -4/3 & 5/3 \\ 0 & -2/3 & -2/3 \end{bmatrix} \xrightarrow{-\frac{1}{2} R_2 \to R_3} \begin{bmatrix} 3 & 5 & 8 \\ 0 & -\frac{4}{3} & 5/3 \\ 0 & 0 & -9/6 \end{bmatrix} = U$$

P

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

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

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(Q3) option 2

b)

$PA = LU$

$PAx = LUx$

$Pb = LUx$

$= Ly$

$$Pb = \begin{bmatrix} 8 \\ 6 \\ 5 \end{bmatrix}$$

$$\begin{bmatrix} 1 & 0 & 0 \\ 2/3 & 1 & 0 \\ 1/3 & 1/2 & 1 \end{bmatrix} \begin{bmatrix} y_{11} \\ y_{21} \\ y_{31} \end{bmatrix} = \begin{bmatrix} 8 \\ 6 \\ 5 \end{bmatrix}$$

$$y = \begin{bmatrix} 8 \\ 2/3 \\ 2 \end{bmatrix}$$

$$\begin{bmatrix} 3 & 5 & 8 \\ 0 & -4/3 & 5/3 \\ 0 & 0 & -5/6 \end{bmatrix} \begin{bmatrix} x_{11} \\ x_{21} \\ x_{31} \end{bmatrix} = \begin{bmatrix} 8 \\ 2/3 \\ 2 \end{bmatrix}$$

$$X = \begin{bmatrix} 149/10 \\ -7/2 \\ -12/5 \end{bmatrix}$$

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Q4) option 2:

$$\min \sum_{i=1}^{4} (y-\hat{y})^2$$

$$\sum_{i=1}^{4} (y-ax-b)^2$$

$$\frac{d \sum_{i=1}^{4} (y-ax-b)^2}{da} = -2 \sum_{i=1}^{4} x(y-ax-b) = 0$$

$$(1) = \sum_{i=1}^{4} xy - ax^2 - bx = 0$$

$$\frac{d \sum_{i=1}^{4} (y-ax-b)^2}{db} = -2 \sum_{i=1}^{4} (y-ax-b) = 0$$

$$(2) = \sum_{i=1}^{4} y - ax - b = 0$$

(contd)

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from ①, $\sum xy = \sum ax^2 + \sum bx$

from ②, $\sum y = \sum ax + \sum b$

matix:

$$\begin{bmatrix} \sum x^2 & \sum x \\ \sum x & 4 \end{bmatrix} \begin{bmatrix} a \\ b \end{bmatrix} = \begin{bmatrix} \sum xy \\ \sum y \end{bmatrix}$$

$$\begin{bmatrix} 59 & 5 \\ 5 & 4 \end{bmatrix} \begin{bmatrix} a \\ b \end{bmatrix} = \begin{bmatrix} -21 \\ 59 \end{bmatrix}$$

$a = \frac{-379}{211}$

$b = \frac{3596}{211}$