

## Step-1

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To solve  $Lc=b$ , we write  $\begin{pmatrix} 1 & 0 \\ 4 & 1 \end{pmatrix} \begin{pmatrix} c_1 \\ c_2 \end{pmatrix} = \begin{pmatrix} 2 \\ 11 \end{pmatrix}$

Subtracting 4 times row 1 from row 2 gives

$$\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix} \begin{pmatrix} c_1 \\ c_2 \end{pmatrix} = \begin{pmatrix} 2 \\ 3 \end{pmatrix}$$

From this the matrices  $c = \begin{pmatrix} c_1 \\ c_2 \end{pmatrix} = \begin{pmatrix} 2 \\ 3 \end{pmatrix}$

## Step-2

To solve  $Ux=c$ , we consider  $\begin{pmatrix} 2 & 4 \\ 0 & 1 \end{pmatrix} \begin{pmatrix} x_1 \\ x_2 \end{pmatrix} = \begin{pmatrix} 2 \\ 3 \end{pmatrix}$

$$\Rightarrow \begin{pmatrix} x_1 \\ x_2 \end{pmatrix} = \begin{pmatrix} -5 \\ 3 \end{pmatrix}$$

## Step-3

$A = LU$  implies

$$\begin{aligned} A &= \begin{pmatrix} 1 & 0 \\ 4 & 1 \end{pmatrix} \begin{pmatrix} 2 & 4 \\ 0 & 1 \end{pmatrix} \\ &= \begin{pmatrix} 2 & 4 \\ 8 & 17 \end{pmatrix} \end{aligned}$$

## Step-4

On the other hand, to solve  $Ax=b$  the system is  $\begin{pmatrix} 2 & 4 \\ 8 & 17 \end{pmatrix} x = \begin{pmatrix} 2 \\ 11 \end{pmatrix}$

Subtracting 4 times row 1 from row 2

$$\begin{pmatrix} 2 & 4 \\ 0 & 1 \end{pmatrix} x = \begin{pmatrix} 2 \\ 3 \end{pmatrix}$$

Divide row 2 with 2 gives

$$\begin{pmatrix} 1 & 2 \\ 0 & 1 \end{pmatrix} x = \begin{pmatrix} 1 \\ 3 \end{pmatrix}$$

Subtracting 2times row 2 from row 1 gives

$$\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix} x = \begin{pmatrix} -5 \\ 3 \end{pmatrix}$$

Here also  $x = \begin{pmatrix} -5 \\ 3 \end{pmatrix}$