

4a

$$\begin{array}{ccc|c} 1 & 2 & 1 & 0 \\ 2 & 2 & 3 & 3 \\ -1 & -3 & 0 & 2 \end{array}$$

$$\begin{array}{ccc} 1 & 0 & 0 \\ 2 & 1 & 0 \\ -1 & 0.5 & 1 \end{array} \Bigg\} = u$$

$$\begin{array}{ccc|c} 1 & 2 & 1 & 0 \\ 0 & -2 & 1 & 3 \\ 0 & -1 & 1 & 2 \end{array}$$

$$\begin{array}{ccc|c} 1 & 2 & 1 & 0 \\ 0 & -2 & 1 & 3 \\ 0 & 0 & 0.5 & 0.5 \end{array}$$

$$\Rightarrow x_3 = 1$$

$$\Rightarrow -2x_2 = 3 - 1 = 2$$

$$\Rightarrow x_2 = -1$$

$$\Rightarrow x_1 = 0 - 1 - 2(-1) = 1$$

$$\Rightarrow x = \begin{pmatrix} 1 \\ -1 \\ 1 \end{pmatrix}$$

$$\textcircled{b} L = \begin{pmatrix} 1 & 0 & 0 \\ 2 & 1 & 0 \\ -1 & \frac{1}{2} & 1 \end{pmatrix}$$

$$u = \begin{bmatrix} 1 & 2 & 1 \\ 0 & -2 & 1 \\ 0 & 0 & \frac{1}{2} \end{bmatrix}$$