

Q6

Thursday, October 29, 2020

8:31 AM

$$a) \begin{pmatrix} 1 & 0 & 0 \\ -1 & 1 & 0 \\ 1 & -1 & 1 \end{pmatrix} \begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix} = \begin{pmatrix} x_1 \\ -x_1 + x_2 \\ x_1 - x_2 + x_3 \end{pmatrix} = \begin{pmatrix} b_1 \\ b_2 \\ b_3 \end{pmatrix}$$

$$\boxed{x_1 = b_1}$$

$$-b_1 + x_2 = b_2$$

$$x_2 = \boxed{b_2 + b_1}$$

$$b_1 - (b_2 + b_1) + x_3 = b_3$$

$$b_1 - b_2 - b_1 + x_3 = b_3$$

$$\boxed{x_3 = b_3 + b_2}$$

$$\therefore \boxed{x_1 = b_1, x_2 = b_1 + b_2, x_3 = b_2 + b_3}$$

$$b) B \begin{pmatrix} b_1 \\ b_2 \\ b_3 \end{pmatrix} = \begin{pmatrix} b_1 \\ b_1 + b_2 \\ b_2 + b_3 \end{pmatrix}$$

$$B \begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix} = \begin{pmatrix} 1 \\ 1 \\ 0 \end{pmatrix}$$

$$\therefore B = \begin{bmatrix} 1 & 0 & 0 \\ 1 & 1 & 0 \\ 0 & 1 & 1 \end{bmatrix}$$

$$B \begin{pmatrix} 0 \\ 1 \\ 0 \end{pmatrix} = \begin{pmatrix} 0 \\ 1 \\ 1 \end{pmatrix}$$

$$B \begin{pmatrix} 0 \\ 0 \\ 1 \end{pmatrix} = \begin{pmatrix} 0 \\ 0 \\ 1 \end{pmatrix}$$

$$\therefore \begin{bmatrix} 1 & 0 & 0 \\ 1 & 1 & 0 \\ 0 & 1 & 1 \end{bmatrix} \begin{pmatrix} b_1 \\ b_2 \\ b_3 \end{pmatrix} = \begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix}$$