Q 1

$$\begin{aligned} 5x_1 + 1x_2 - 0.5x_3 &= 13.5 \\ -6x_1 - 12x_2 + 4x_3 &= -123 \\ 2x_1 + 2x_2 + 10x_3 &= -43 \end{aligned}$$

$$\begin{bmatrix} 5 & 1 & -.05 & 13.5 \\ -6 & -12 & 4 & -123 \\ 2 & 2 & 10 & -43 \end{bmatrix}$$

$$\begin{bmatrix} 1 & .2 & -.1 & 2.7 \\ -6 & -12 & 4 & -123 \\ 2 & 2 & 10 & -43 \end{bmatrix}$$

$$\begin{bmatrix} 1 & 0.2 & -.1 & 2.7 \\ 0 & 10.8 & 3.4 & -106.8 \\ 0 & 1.6 & 10.2 & -48.4 \end{bmatrix}$$

$$\begin{bmatrix} 1 & 0.2 & -.1 & 2.7 \\ 0 & 1 & -.315 & 9.888 \\ 0 & 1.6 & 10.2 & -48.4 \end{bmatrix}$$

$$\begin{bmatrix} 1 & 0 & -.037 & .722 \\ 0 & 1 & -.315 & .988 \\ 0 & 0 & 10.704 & -64.22 \end{bmatrix}$$

$$\begin{bmatrix} 1 & 0 & -.037 & .7222 \\ 0 & 1 & -.315 & 9.88 \\ 0 & 0 & 1 & -6 \end{bmatrix}$$

$$\begin{bmatrix} 1 & 0 & 0 & .5 \\ 0 & 1 & 0 & 8 \\ 0 & 0 & 1 & -6 \end{bmatrix}$$

$$X = \begin{bmatrix} .5 \\ 8 \\ -6 \end{bmatrix}$$

$$\begin{bmatrix} 5 & 1 & -.5 \\ -6 & -12 & 4 \\ 2 & 2 & 10 \end{bmatrix} \begin{bmatrix} -5 \\ 8 \\ 6 \end{bmatrix} = \begin{bmatrix} 13.5 \\ -123 \\ -43 \end{bmatrix}$$

✓

Q2

$$\begin{bmatrix} 8 & 4 & -1 \\ -2 & 5 & 1 \\ 2 & -1 & 6 \end{bmatrix} \begin{bmatrix} 1 \\ x \\ 1 \end{bmatrix} = \begin{bmatrix} 11 \\ 4 \\ 7 \end{bmatrix}$$

U:

$$\begin{bmatrix} 8 & 4 & -1 \\ 0 & 6 & .75 \\ 0 & -2 & 6.25 \end{bmatrix}$$

L:

$$\begin{bmatrix} 1 & 0 & 0 \\ -1/4 & 1 & \\ 1/4 & 0 & 1 \end{bmatrix}$$

$$U = \begin{bmatrix} 8 & 4 & -1 \\ 0 & 6 & .75 \\ 0 & 0 & 6.5 \end{bmatrix} \qquad L = \begin{bmatrix} 1 & 0 & 0 \\ -.25 & 1 & 0 \\ .25 & -.333 & 1 \end{bmatrix}$$

$$L \times d = b$$

$$\begin{bmatrix} 1 & 0 & 0 \\ -.25 & 1 & 0 \\ -.25 & -.333 & 1 \end{bmatrix} \begin{bmatrix} 1 \\ d \\ 1 \end{bmatrix} = \begin{bmatrix} 11 \\ 4 \\ 7 \end{bmatrix}$$

$$d_1 = 11$$
$$d_2 = 6.75$$
$$d_3 = 6.5$$

$$\begin{bmatrix} 8 & 4 & -1 \\ 0 & 6 & .75 \\ 0 & 0 & 6.5 \end{bmatrix} \begin{bmatrix} 1 \\ x \\ 1 \end{bmatrix} = \begin{bmatrix} 11 \\ 6.75 \\ 6.5 \end{bmatrix}$$

$$x_3 = 1$$
$$x_2 = 1$$
$$x_1 = 1$$

Verification: My results by hand match the results of my conceptual model, therefore my solution is verified. I proved my conceptual model is functional.