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Math 2270
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Homework 1

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Excellent

1.

$$\vec{u} = \begin{pmatrix} 2 \\ -1 \\ 0 \end{pmatrix} \quad \vec{v} = \begin{pmatrix} -1 \\ 2 \\ -1 \end{pmatrix} \quad w = \begin{pmatrix} 0 \\ -1 \\ 2 \end{pmatrix} \quad \vec{b} = \begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix}$$

$$c\vec{u} + d\vec{v} + e\vec{w} = \vec{b}$$

$$c\begin{pmatrix} 2 \\ -1 \\ 0 \end{pmatrix} + d\begin{pmatrix} -1 \\ 2 \\ -1 \end{pmatrix} + e\begin{pmatrix} 0 \\ -1 \\ 2 \end{pmatrix} = \begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix}$$

$$\begin{pmatrix} 2c \\ -c \\ 0 \end{pmatrix} + \begin{pmatrix} -d \\ 2d \\ -d \end{pmatrix} + \begin{pmatrix} 0 \\ -e \\ 2e \end{pmatrix} = \begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix}$$

$$\begin{cases} 2c - d = 1 \\ -c + 2d - e = 0 \\ -d + 2e = 0 \end{cases}$$

$$\begin{cases} c + d - e = 1 \\ -c + 2d - e = 0 \\ -d + 2e = 0 \end{cases} \quad \text{combo}(2, 1, 1)$$

$$\begin{cases} c + d - e = 1 \\ 3d - 2e = 1 \\ -d + 2e = 0 \end{cases} \quad \text{combo}(1, 2, 1)$$

$$\begin{cases} c + d - e = 1 \\ 2d = 1 \\ -d + 2e = 0 \end{cases} \quad \text{combo}(3, 2, 1)$$

$$\begin{cases} c + d - e = 1 \\ d = \frac{1}{2} \\ -d + 2e = 0 \end{cases} \quad \text{multiply}(2, \tfrac{1}{2})$$

$$\begin{cases} c + d - e = 1 \\ d = \frac{1}{2} \\ -2e = \frac{1}{2} \end{cases} \quad \text{combo}(2, 3, 1)$$

$$\begin{cases} c + d - e = 1 \\ d = \frac{1}{2} \\ e = -\frac{1}{4} \end{cases} \quad \text{multiply}(3, \tfrac{1}{2})$$

$$\begin{cases} c - e = \frac{1}{2} \\ d = \frac{1}{2} \\ e = -\frac{1}{4} \end{cases} \quad \text{combo}(2, 1, -1)$$

continued →

$$\begin{cases} c = \frac{3}{4} \\ d = \frac{1}{2} \\ e = \frac{1}{4} \end{cases}$$

$$\begin{pmatrix} 2\cdot\frac{3}{4} \\ -\frac{3}{4} \\ 0 \end{pmatrix} + \begin{pmatrix} -\frac{1}{2} \\ 1 \\ -\frac{1}{2} \end{pmatrix} + \begin{pmatrix} 0 \\ -\frac{1}{4} \\ \frac{1}{2} \end{pmatrix} \stackrel{?}{=} \begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix} \quad \text{(answer check)}$$

$$\begin{pmatrix} \frac{3}{2} - \frac{1}{2} + 0 \\ -\frac{3}{4} + 1 - \frac{1}{4} \\ 0 - \frac{1}{2} + \frac{1}{2} \end{pmatrix} \stackrel{?}{=} \begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix}$$

$$\begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix} \stackrel{?}{=} \begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix}$$

QED