1 Question 1

Given

$$\text{Given } \vec{v_3} = \begin{bmatrix} 1 \\ 2 \\ 3 \\ 4 \end{bmatrix} \text{ is } \vec{v_3} \in \text{span}\{\vec{v_1}, \vec{v_2}\}?$$

$$\text{where } \vec{v_1} = \begin{bmatrix} 1 \\ 1 \\ -1 \\ 1 \end{bmatrix} \text{ and } \vec{v_2} = \begin{bmatrix} 1 \\ -1 \\ 1 \\ 0 \end{bmatrix}.$$

Solution We're given thast we can consider these vectors as

$$A = \begin{bmatrix} 1 & 1 \\ -1 & 1 \end{bmatrix}, B = \begin{bmatrix} 1 & -1 \\ 1 & 0 \end{bmatrix}, C = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$$

We're still asking the same question, so let's see how that breaks down

$$c_1 \begin{bmatrix} 1 & 1 \\ -1 & 1 \end{bmatrix} + c_2 \begin{bmatrix} 1 & -1 \\ 1 & 0 \end{bmatrix} = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$$

This gives us the following system of equations

$$\begin{aligned} c_1 + c_2 &= 1 \\ c_1 - c_2 &= 2 \\ c_1 &= 3 \\ c_1 &= 4 \end{aligned}$$

Seen as we can't reconcile the last two equations, we can see that this system is inconsistent.

2 Question 2

Restate Is $\mathbf{v}_4 = \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix} \in \text{span}\{\mathbf{v}_1, \mathbf{v}_2, \mathbf{v}_3\}$?

Values

$$\mathbf{v}_1 = \begin{bmatrix} 1 \\ -2 \\ 0 \end{bmatrix}, \mathbf{v}_2 = \begin{bmatrix} 0 \\ 1 \\ -1 \end{bmatrix}, \mathbf{v}_3 = \begin{bmatrix} -2 \\ -3 \\ 1 \end{bmatrix}$$

Form span$\{p(x), q(x), r(x)\}$ is of the form

$$p(x) = 1 - 2x + 0x^2$$
$$q(x) = 0 + 1x - 1x^2$$
$$r(x) = -2 - 3x + 1x^2$$

Investigation