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3. Express $v = \begin{bmatrix} 3 \\ 4 \\ 5 \end{bmatrix}$ as a linear combination of $v_1 = \begin{bmatrix} 1 \\ 2 \\ 1 \end{bmatrix}$ and $v_2 = \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$, if possible.

Solve $\left[\begin{array}{cc|c} 1 & 1 & 3 \\ 2 & 1 & 4 \\ 1 & 1 & 5 \end{array}\right]$ $\begin{array}{l} R2 \mapsto R2-2R1 \\ R3 \mapsto R3-R1 \end{array}$ $\left[\begin{array}{cc|c} 1 & 1 & 3 \\ 0 & -1 & -2 \\ 0 & 0 & 2 \end{array}\right]$ This system of equation has no solution so v does not equal a linear combination of v_1 and v_2.

4. Consider the following system of linear equations:

$$\begin{aligned} x_1 + x_2 \qquad\qquad\qquad - x_5 &= 1 \\ x_2 + 2x_3 + x_4 + 3x_5 &= 1 \\ x_1 \qquad - x_3 + x_4 + x_5 &= 0. \end{aligned}$$

Write these equations in the form $Ax = b$, where A is a matrix and x and b are column vectors.

$$\begin{bmatrix} 1 & 1 & 0 & 0 & -1 \\ 0 & 1 & 2 & 1 & 3 \\ 1 & 0 & -1 & 1 & 1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \\ x_5 \end{bmatrix} = \begin{bmatrix} 1 \\ 1 \\ 0 \end{bmatrix}$$