$$x_1\mathbf{a}_1 \quad + \quad x_2\mathbf{a}_2 \quad = \quad \mathbf{b}$$

$$x_1\begin{bmatrix} 1 \\ 0 \\ -3 \end{bmatrix} + x_2\begin{bmatrix} -1 \\ -2 \\ 7 \end{bmatrix} = \begin{bmatrix} -3 \\ 4 \\ 1 \end{bmatrix}$$

$$\begin{bmatrix} x_1 - x_2 \\ 0 - 2x_2 \\ -3x_1 + 7x_2 \end{bmatrix} = \begin{bmatrix} -3 \\ 4 \\ 1 \end{bmatrix}$$

$$\begin{aligned} x_1 - x_2 &= -3 \\ 0 - 2x_2 &= 4 \\ -3x_1 + 7x_2 &= 1 \end{aligned}$$

Solve this system by row reducing the augmented matrix:

$$\begin{bmatrix} 1 & -1 & -3 \\ 0 & -2 & 4 \\ -3 & 7 & 1 \end{bmatrix} \sim \begin{bmatrix} 1 & -1 & -3 \\ 0 & -2 & 4 \\ 0 & 4 & -8 \end{bmatrix} \sim \begin{bmatrix} 1 & -1 & -3 \\ 0 & -2 & 4 \\ 0 & 0 & 0 \end{bmatrix}$$

The system is consistent, so $\mathbf{b}$ is a linear combination of $\mathbf{a}_1$ and $\mathbf{a}_2$. To find the weights, complete the row reduction, and obtain $x_1 = -5$, $x_2 = -2$. Thus

$$-5\mathbf{a}_1 - 2\mathbf{a}_2 = \mathbf{b}$$