$$x_{1}\mathbf{a}_{1} + x_{2}\mathbf{a}_{2} = \mathbf{b}$$

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

$$\begin{bmatrix}x_{1} - x_{2}\\7\end{bmatrix} = \begin{bmatrix}-3\\4\\1\end{bmatrix}$$

$$\begin{bmatrix}x_{1} - x_{2}\\-3x_{1} + 7x_{2}\end{bmatrix} = \begin{bmatrix}-3\\4\\1\end{bmatrix}$$

$$x_{1} - x_{2} = -3$$

$$0 - 2x_{2} = 4$$

$$-3x_{1} + 7x_{2} = 1$$

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 **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

 $-5a_1 - 2a_2 = b$ 

## 1.3.05

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