25. The vectors $\mathbf{v} = \begin{bmatrix} 0 \\ 4 \\ 2 \end{bmatrix}$ and $\mathbf{w} = \begin{bmatrix} 5 \\ 6 \\ -7 \end{bmatrix}$ are linearly independent and span a two dimensional subspace W of $\mathbb{R}^3$. Use the Gram-Schmidt process to find an orthogonal basis of W including $\mathbf{v}$. What is the other vector in the basis?

A) $\begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$ B) $\begin{bmatrix} 5 \\ 6 \\ -7 \end{bmatrix}$ C) $\begin{bmatrix} 5 \\ 4 \\ -7 \end{bmatrix}$ D) $\begin{bmatrix} 5 \\ 4 \\ -8 \end{bmatrix}$ E) $\begin{bmatrix} 5 \\ 4 \\ 2 \end{bmatrix}$

$\vec{V_1} = \vec{V}$

$\vec{V_2} = \vec{W} - \frac{\vec{W} \cdot \vec{V_1}}{\vec{V_1} \cdot \vec{V_1}} \vec{V_1} = \begin{bmatrix} 5 \\ 6 \\ -7 \end{bmatrix} - \frac{10}{20} \begin{bmatrix} 0 \\ 4 \\ 2 \end{bmatrix}$

(By Gram-Schmidt)

$= \begin{bmatrix} 5-0 \\ 6-2 \\ -7-1 \end{bmatrix} = \begin{bmatrix} 5 \\ 4 \\ -8 \end{bmatrix}$