$$\begin{array}{ccc} \underline{v}_1 & \underline{v}_2 & \underline{v}_3 \\ \begin{pmatrix}1\\2\\1\end{pmatrix} & \begin{pmatrix}-1\\2\\1\end{pmatrix} & \begin{pmatrix}0\\2\\1\end{pmatrix} \end{array}$$

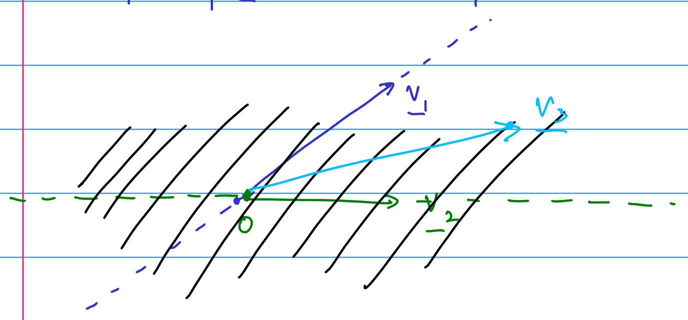
$$\alpha_1 \begin{pmatrix}1\\2\\1\end{pmatrix} + \alpha_2 \begin{pmatrix}-1\\2\\1\end{pmatrix} + \alpha_3 \begin{pmatrix}0\\2\\1\end{pmatrix}$$

* Set of all linear combinations (L).

* Does $\begin{pmatrix}0\\0\\0\end{pmatrix} \in L$?

Can $\begin{pmatrix}0\\0\\0\end{pmatrix}$ be written as a linear comb of $\underline{v}_1, \underline{v}_2, v_3$?

$$\alpha \underline{v}_1 + \beta \underline{v}_1 = (\alpha+\beta)\underline{v}_1$$



DOT PRODUCTS

1. $\underline{v}_1 = \begin{pmatrix}1\\2\\1\end{pmatrix}$ $\quad \underline{v}_2 = \begin{pmatrix}-1\\2\\1\end{pmatrix}$

$$\underline{v}_1 \cdot \underline{v}_2 = 1(-1) + 2(2) + 1(1) = 4.$$

2. If $\underline{v} \cdot \underline{w} = 0$, we say $\underline{v}$ and $\underline{w}$ are orthogonal.

3. $(\text{Length of } \underline{v})^2 = \underline{v} \cdot \underline{v}$.