

Vector Equations

1. Determine if \mathbf{b} is a linear combination of \mathbf{a}_1 , \mathbf{a}_2 , and \mathbf{a}_3 .

(a)

$$\mathbf{a}_1 = \begin{bmatrix} 1 \\ 0 \\ 1 \end{bmatrix}, \mathbf{a}_2 = \begin{bmatrix} -2 \\ 3 \\ -2 \end{bmatrix}, \mathbf{a}_3 = \begin{bmatrix} -6 \\ 7 \\ 5 \end{bmatrix}, \mathbf{b} = \begin{bmatrix} 11 \\ -5 \\ 9 \end{bmatrix}$$

(b)

$$\mathbf{a}_1 = \begin{bmatrix} 2 \\ 1 \\ -1 \end{bmatrix}, \mathbf{a}_2 = \begin{bmatrix} 1 \\ 0 \\ -3 \end{bmatrix}, \mathbf{a}_3 = \begin{bmatrix} 3 \\ 1 \\ -4 \end{bmatrix}, \mathbf{b} = \begin{bmatrix} -3 \\ 5 \\ -1 \end{bmatrix}$$

2. Let \mathbf{a}_1 , \mathbf{a}_2 , and \mathbf{b} be given below. For what value(s) of h is \mathbf{b} in the plane spanned by \mathbf{a}_1 and \mathbf{a}_2 ?

$$\mathbf{a}_1 = \begin{bmatrix} 1 \\ 3 \\ -1 \end{bmatrix}, \mathbf{a}_2 = \begin{bmatrix} -5 \\ -8 \\ 2 \end{bmatrix}, \mathbf{b} = \begin{bmatrix} 3 \\ -5 \\ h \end{bmatrix}$$

3. Show that $\begin{bmatrix} p \\ q \\ r \end{bmatrix}$ is in $\text{Span}\{\mathbf{u}, \mathbf{v}, \mathbf{w}\}$ for all real p, q, r where

$$\mathbf{u} = \begin{bmatrix} 1 \\ -2 \\ 3 \end{bmatrix}, \mathbf{v} = \begin{bmatrix} 5 \\ -13 \\ -3 \end{bmatrix}, \mathbf{w} = \begin{bmatrix} -3 \\ 8 \\ 1 \end{bmatrix}$$