Linear Independence

Suppose $\mathbf{v_1} = \begin{bmatrix} 1 \\ 0 \\ 2 \end{bmatrix}$, $\mathbf{v_2} = \begin{bmatrix} 0 \\ 2 \\ 2 \end{bmatrix}$, $\mathbf{v_3} = \begin{bmatrix} 0 \\ 0 \\ 3 \end{bmatrix}$. Find x_1, x_2, and x_3 such that $x_1\mathbf{v_1} + x_2\mathbf{v_2} + x_3\mathbf{v_3} = \mathbf{0}$.
where $\mathbf{0}$ is the zero vector in $\mathbf{R}^3$.

An indexed set of vectors $\{\mathbf{v_1}, \mathbf{v_2}, \mathbf{v_3}, \ldots, \mathbf{v_n}\}$ in $\mathbf{R}^n$ is said to be ***linearly independent*** iff the vector equation

$$x_1\mathbf{v_1} + x_2\mathbf{v_2} + x_3\mathbf{v_3} + \ldots + x_n\mathbf{v_n} = \mathbf{0}$$

has only the trivial solution. Otherwise, the set of vectors is said to be ***linearly dependent***.

Suppose $\mathbf{v_1} = \begin{bmatrix} 1 \\ 0 \\ 2 \end{bmatrix}$, $\mathbf{v_2} = \begin{bmatrix} 0 \\ 2 \\ 2 \end{bmatrix}$, $\mathbf{v_3} = \begin{bmatrix} 2 \\ 6 \\ 10 \end{bmatrix}$. Determine whether or not the set $\{\mathbf{v_1}, \mathbf{v_2}, \mathbf{v_3}\}$ is linearly independent.

Suppose $A = \begin{bmatrix} 1 & 0 & 1 \\ 0 & 2 & 0 \\ 2 & 2 & 4 \end{bmatrix}$. Are the columns of A linearly independent?

Suppose $\mathbf{v_1} = \begin{bmatrix} 1 \\ 2 \end{bmatrix}$, $\mathbf{v_2} = \begin{bmatrix} 3 \\ 6 \end{bmatrix}$, and $\mathbf{v_3} = \begin{bmatrix} 0 \\ 4 \end{bmatrix}$.

Is the set $\{\mathbf{v_1}, \mathbf{v_2}, \mathbf{v_3}\}$linearly independent?

Is the set $\{\mathbf{v_1}, \mathbf{v_2}\}$ linearly independent?

Is the set $\{\mathbf{v_1}, \mathbf{v_3}\}$ linearly independent?

Do the columns of $\begin{bmatrix} 2 & 4 & 6 \\ 2 & 5 & 8 \end{bmatrix}$ span R^2? Are the columns of $\begin{bmatrix} 2 & 4 & 6 \\ 2 & 5 & 8 \end{bmatrix}$ linearly independent?

Are the columns of $\begin{bmatrix} 2 & 0 & 4 \\ 0 & 0 & 3 \end{bmatrix}$ linearly independent?