

Group Work: Linear Combinations

MATH 204: Linear Algebra

September 5, 2018

1. Suppose $\mathbf{a}_1 = \begin{bmatrix} 1 \\ 0 \\ 3 \end{bmatrix}$, $\mathbf{a}_2 = \begin{bmatrix} 4 \\ 2 \\ 14 \end{bmatrix}$ and $\mathbf{a}_3 = \begin{bmatrix} 3 \\ 6 \\ 10 \end{bmatrix}$. (Read all parts of question before beginning.)

(a) Using our guidelines discussed, determine IF $\mathbf{b} = \begin{bmatrix} -1 \\ 8 \\ -5 \end{bmatrix}$ is a linear combination of \mathbf{a}_1 , \mathbf{a}_2 and \mathbf{a}_3 .

(b) If you determined that \mathbf{b} is a linear combination, show explicitly what it is.

(c) Using the word “span”, write a sentence saying what you can conclude about the vectors $\mathbf{a}_1, \mathbf{a}_2, \mathbf{a}_3$, and \mathbf{b} and why.

2. Suppose $\mathbf{v}_1 = \begin{bmatrix} 2 \\ 1 \end{bmatrix}$ and $\mathbf{v}_2 = \begin{bmatrix} -2 \\ 2 \end{bmatrix}$. The following grid illustrates integer multiples of these two vectors.

(a) Draw the following vectors on the grid above: $\mathbf{a} = \begin{bmatrix} 0 \\ 3 \end{bmatrix}$, $\mathbf{b} = \begin{bmatrix} -4 \\ 1 \end{bmatrix}$, $\mathbf{c} = \begin{bmatrix} 6 \\ 6 \end{bmatrix}$, $\mathbf{d} = \begin{bmatrix} 7 \\ -4 \end{bmatrix}$.

(b) Using the grid as a guide, express each of the vectors in (a) as a linear combination of \mathbf{v}_1 and \mathbf{v}_2 .

(c) What are the vectors that are the basis for the grid we typically use when graphing functions?