

Source: [KBe20math530refVectorSpace](#)

1 | #definition span

The set of all linear combinations of a list of vectors v_1, \dots, v_m in V is called the span of v_1, \dots, v_m , denoted $\text{span}(v_1, \dots, v_m)$:

$$\text{span}(v_1, \dots, v_m) = \{a_1 v_1 + \dots + a_m v_m \mid a_1, \dots, a_m \in F\}$$

And the span of an empty list $()$ is $\{0\}$

2 | Properties

- The span is the smallest containing subspace
 - The span of a list of vectors in V is the smallest subspace of V containing all the vectors in the list.

#definition spans

If $\text{span}(v_1, \dots, v_m) = V$, then v_1, \dots, v_m **spans** V

3 | Examples

Axler 2.9

Suppose n is a positive integer. Show that $(1, 0, \dots, 0), (0, 1, 0, \dots, 0), \dots, (0, \dots, 0, 1)$ spans F^n . - Basically, if a list of vectors spans a vector space then linear combinations of those vectors (almost like colloquial polynomials of those vectors) can form each vector in the space. - In this case, the vector space F^n is a list of vectors in F , and having the 1 in each slot is enough to, when scalar multiplied with $a \in F$, get all possibilities of F^n . - I need to wrap my head around this some more.
