

Span

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DEFINITION

The *span* of a set of vectors V is the set of all linear combinations of vectors in V . That is,

$$\text{span } V = \{ \vec{v} : \vec{v} = \alpha_1 \vec{v}_1 + \alpha_2 \vec{v}_2 + \cdots + \alpha_n \vec{v}_n \text{ for some } \vec{v}_1, \vec{v}_2, \dots, \vec{v}_n \in V \text{ and scalars } \alpha_1, \alpha_2, \dots, \alpha_n \}.$$

Additionally, we define $\text{span}\{\} = \{\vec{0}\}$.

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Let $\vec{v}_1 = \begin{bmatrix} 1 \\ 1 \end{bmatrix}$, $\vec{v}_2 = \begin{bmatrix} 1 \\ -1 \end{bmatrix}$, and $\vec{v}_3 = \begin{bmatrix} 2 \\ 2 \end{bmatrix}$.

- 15.1 Draw $\text{span}\{\vec{v}_1\}$.
- 15.2 Draw $\text{span}\{\vec{v}_2\}$.
- 15.3 Describe $\text{span}\{\vec{v}_1, \vec{v}_2\}$.
- 15.4 Describe $\text{span}\{\vec{v}_1, \vec{v}_3\}$.
- 15.5 Describe $\text{span}\{\vec{v}_1, \vec{v}_2, \vec{v}_3\}$.

