Vector Spaces and Basis

Vector Space V

Set closed under **addition** and **scalar multiplication**

- $\mathbb{R}^n$ (n-dimensional space)
- Polynomial space
- Function space

Linear Combination

$v = c_1v_1 + c_2v_2 + \ldots + c_nv_n$

Span

All possible linear combinations of vectors

Linear Independence

No vector is combination of others

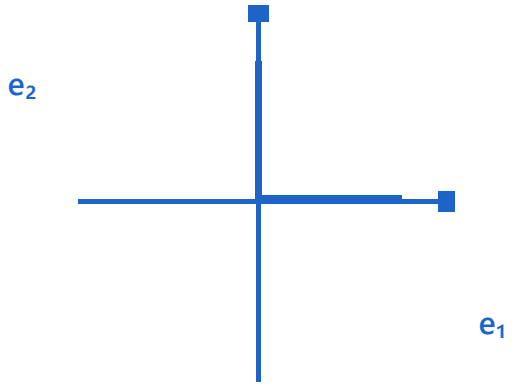
Basis

Minimal spanning set (linearly independent)

Dimension

Number of basis vectors

Standard Basis in $\mathbb{R}^2$



Standard Basis in $\mathbb{R}^n$

$$e_1 = (1, 0, \ldots, 0)$$

$$e_2 = (0, 1, \ldots, 0)$$

Any vector $v = c_1e_1 + c_2e_2 + \ldots + c_ne_n$