

Linear combination and SpanningSets

$$v_1, v_2, \dots, v_n \in V \quad \text{and} \quad a_1, a_2, \dots, a_n \in F$$

$$u \in V$$

$$u = a_1 v_1 + a_2 v_2 + \dots + a_n v_n \quad 1 \leq i \leq n$$

u is called linear combination of v_1, v_2, \dots, v_n

Example

$$V(\mathbb{R}^3(\mathbb{R}))$$

$$v_1 = (1, 0, 0), \quad v_2 = (0, 1, 0), \quad v_3 = (0, 0, 1)$$

$$a = (1, 5, 2)$$

$$1(1, 0, 0) + 5(0, 1, 0) + 2(0, 0, 1)$$

is linear combination of $(1, 5, 2)$

Spanning Set

$$\emptyset \neq S \subset V(F)$$

The set contains of all linear combination of the elements of S

It is denoted by $\langle S \rangle$

Example

$$S = \{e_1, e_2, e_3\}$$

Consider

$$V = \mathbb{R}^3(\mathbb{R}), \quad (a, b, c) \in \mathbb{R}^3$$

$$e_1 = (1, 0, 0), \quad e_2 = (0, 1, 0), \quad e_3 = (0, 0, 1)$$

$$(a, b, c) = a(1, 0, 0) + b(0, 1, 0) + c(0, 0, 1)$$

$$\mathbb{R}^3 = \langle S \rangle$$