

**Source:**

## 1 | **Broader vector spaces**

- Doesn't have to be physics vectors
- maybe it's like matrices
- or linear maps themselves

## 2 | **The Linear Map 0**

A linear map  $S = 0$  is a map where  $Su = 0 \forall u$ .

## 3 | **Axler 3.A ex7**

Let  $w = Tv$ .

### 3.1 | **If $v = 0$ then**

$$Tv = 0$$

By Axler 3.11 (Maps take 0 to 0). Thus,  $\lambda$  can be anything in  $\mathbb{F}$ .

### 3.2 | **Otherwise,**

$\frac{1}{v} \in \mathbb{F}$  because the field has multiplicative inverses for all elements except 0.

$$Tv = w = \left(w \frac{1}{v}\right) v$$

Let  $\lambda = w \frac{1}{v}$ , then

$$\lambda v = w \frac{1}{v} v = w$$

which is in  $\mathbb{F}$  because  $w, \frac{1}{v} \in \mathbb{F}$  and fields are closed under multiplication.

## 4 | **Axler 3.A ex10**