

## 1 | In the context of Linear Algebra (Axler 3.15)

### 1.1 | #definition injective

**def**

A function  $T : V \rightarrow W$  is called *injective* if  $Tu = Tv$  implies  $u = v$

### 1.2 | #aka one-to-one

**aka**

### 1.3 | Properties

#### 1.3.1 | A map is injective iff it's null space equals $\{0\}$

#### 1.3.2 | A map to a smaller dimensional space is not injective (Axler 3.23)

Suppose  $V$  and  $W$  are finite-dimensional vector spaces such that  $\dim V > \dim W$ . Then no linear map from  $V$  to  $W$  is injective.

1. Intuition That makes sense, because if the output space has a smaller dimension, then there should be two inputs that go to the same output somewhere. Otherwise all the inputs just don't "fit".

### 1.4 | Intuition

$Tu = Tv \Rightarrow u = v$  means that if the outputs are the same, then the inputs are the same, aka only one input goes to that one output. That's why it's called "one-to-one": only one input goes to that one output