

# Tensor Notes

Alexander J. Heilman

revised: July 12, 2021

## Contents

1	"Elementary vector spaces"	1
2	"How to make a map."	1

## About

The following is a set of notes following along with the youtube series by XylyXylyX titled "What is a Tensor?".

## 1 "Elementary vector spaces"

**Definition:** A *vector space* is a set  $V$  of vectors over some field  $F$  with two properties, scalar multiplication  $F \times V \rightarrow V$  (which is distributive wrt addition and is associative) and vector addition  $V + V \rightarrow V$  (which is distributive wrt multiplication and is associative and commutative)

## 2 "How to make a map."

Maps can be denoted  $\langle \Lambda, \vec{v} \rangle$ , where  $\Lambda$  is a map  $\Lambda : V \rightarrow V$  and  $\vec{v} \in V$  is a vector. Maps between vector spaces can be completely defined by their action on respective basis vectors'. Linear maps on vector spaces are defined to be those such that  $\langle \Lambda, \alpha \vec{v}_1 + \beta \vec{v}_2 \rangle = \alpha \langle \Lambda, \vec{v}_1 \rangle + \beta \langle \Lambda, \vec{v}_2 \rangle$