#flo

1 | Talking about the reading (vector spaces)

1.1 | Vector space

1.1.1 | Identity

- It would be the additive identity, because the multiplicitive one doesn't count because multiply doesn't take two elements from the same field #### Operations
- Scalar multiplication
  - Not a multiplication on V
  - We need another field of scalars
  - Fundamental difference: **operates on different objects** (only happens on scalar multiplications)
- addition #### Linearity
- Something that's linear means "things work for addition and scalar multiplication"
- Take $-2x + 1y = 3$
  - Multiplying by scalars
  - adding them
  - similar to a line in standard form–slope stays constant
- Take $2x - 3y + 1z = 2$
  - a plane in 3d
  - if you pick a direction, the slope stays the same
  - thus, a plane is linear #### Vector
- Something in a vector space
- inifinite lists
  - It's like decimals, except you can chose any number instead of just [0-9]
  - base infinity basically
- Most common vector space
  - $\mathbb{F}^n$, like $\mathbb{R}^3$ (might also be $\mathbb{C}^2$ or something, although that's hard to visualize)
  - #definition canonical
    - something "standard", basically everyone should know what you are talking about
    - canonical vector space is $\mathbb{R}^2$ #### Distributive property
- Important to tie operations together

1.1.2 | Vector Space as a Set of Functions

- like $\mathbb{R}^{[0,1]}$: the functions from $[0,1]$ that end up as real numbers
  - Identity = $f(x) = 0$ #### Subspaces
- A subspace of this has to be a group on it's own
- Conditions for a subspace
  - See 1.34
  - Just check
    - additive identity
    - closed under addition
    - closed under scalar multiplication
- What other subspaces of this vector space are there that also have a domain from $[0,1]$?
  - Like continuous functions from zero to one
  - functions who's derivatives are continuous or constant or zero
  - even functions are also a subspace KBe20math530srcEvenFunctionsAreSubspacesOfFtotheS.png
- Subspaces of $\mathbb{F}^3$
  - Most contain infinite vectors (except $\{0\}$)
  - $\begin{bmatrix} x \\ y \\ 0 \end{bmatrix}$ is a subspace with infinite vectors #### Notation
- #note $\mathbb{F}^2$ is almost always either $\mathbb{R}^2$ or $\mathbb{C}^2$, mostly $\mathbb{R}^2$

1.2 | Direct sums

- Something that isn't a direct sum
  - in $\mathbb{R}^3$, $\begin{bmatrix} x \\ y \\ 0 \end{bmatrix}$ and $\begin{bmatrix} x \\ x \\ 0 \end{bmatrix}$
    - Two ways to write 0:
      - $\begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix} + \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix} = \begin{bmatrix} 1 \\ 1 \\ 0 \end{bmatrix} + \begin{bmatrix} -1 \\ -1 \\ 0 \end{bmatrix}$ ## $\mathbb{F}^\infty$
- Functions from naturals to your field, (assign an element to each natural)
  - that would be the same as ordering the elements in your field?
  - Tons of functions, any one is an infinite vector??

2 | If and Only If proofs (iff)

- You have to take the proof in both directions
- **Assumption**: "now suppose the only way to write 0 as a sum of u_1 + … | u_m, where each u_j is in U_j, is by taking each u_j equal to 0"
  - Assume the red part, then show the green part. Then, assume the green and show it gets the red.
  - KBe20math530srcIfOnlyIfProofs.png
- #future geometrical interpretation of determinants