

Algebraic structures :-

$$\mathbb{Z}, \mathbb{Q} \cong \mathbb{R}[x], \{f: [a, b] \rightarrow \mathbb{R}\}$$

$$f: [a, b] \rightarrow \mathbb{R}$$

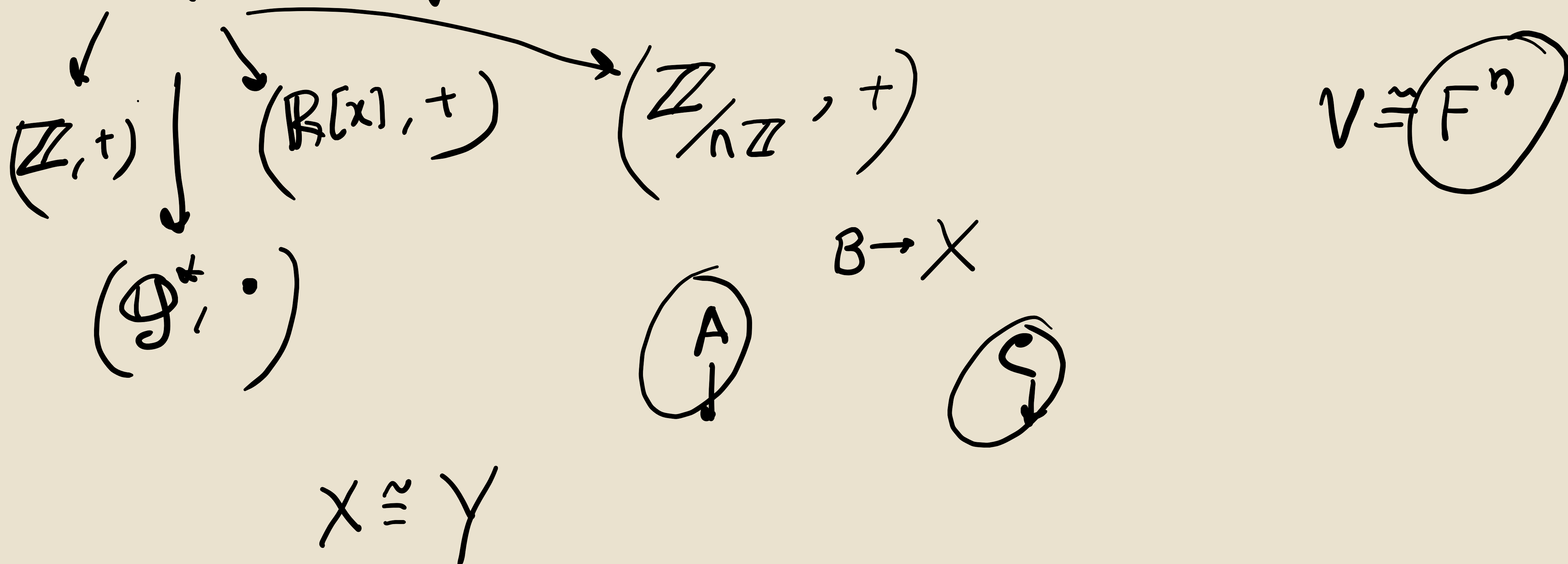
$$g: [a, b] \rightarrow \mathbb{R}$$

$$(f+g): [a, b] \rightarrow \mathbb{R}$$

$$(f+g)(x) = f(x) + g(x)$$

Sets,

Groups, Rings / Fields, Module / Vector Space, Algebra



Linear Algebra :-

Groups :-

$$(G, +), +: G \times G \rightarrow G \text{ s.t.}$$

i) + is associative, i.e.

$$(a+b)+c = a+(b+c) = a+b+c$$

ii) $\exists 0 \in G \text{ s.t. } \forall g \in G$

$$g+0 = 0+g = g$$

iii) For every $g \in G, \exists h \in G \text{ s.t.}$

$$g+h = h+g = 0$$

Since this h is unique we define h to be the "inverse of g ", $(-g)$.

$$a+b = a+c \Rightarrow b=c$$

$$b = 0+b = (-a)+a+b = (-a)+(a+b) = (-a)+(a+c) = ((-a)+a)+c = 0+c = c$$

$a+b = b+a \quad \forall a, b \in G$
Abelian Group

b) Rings :- $(R, +, \cdot)$ such that

i) $(R, +)$ is an Abelian Group

$$\cdot : R \times R \rightarrow R \text{ s.t.}$$

ii \cdot is associative, i.e.

$$(a \cdot b) \cdot c = a \cdot (b \cdot c) = abc$$

iii) $\exists 1 \in R$ s.t. $a \cdot 1 = 1 \cdot a = a \quad \forall a \in R$

iv) $a(b+c) = ab+ac$

$(F, +, \cdot)$ be a ^{commutative} ring such that $1 \neq 0$ and
 $(F \setminus \{0\}, \cdot)$ is a group

F is a field.