1) Set :

$x \in S \Rightarrow y$

$A \subset S \supset B$

$A := \{0, 2, 4, 6, \dots\}$

$A := \{x \in S \mid \text{Conditions on } x\}$

A , B

$$A \times B =: C = \{ (a,b) \mid a \in A, b \in B \}$$

$|A|$

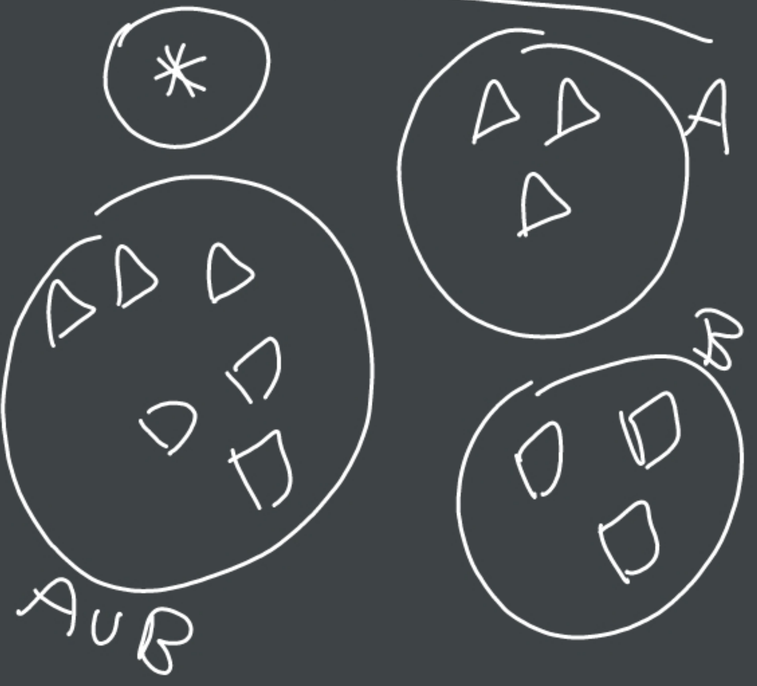
$$A^n := \underbrace{A \times A \times \cdots \times A \times A}_{n\text{-times}}$$

$(a_1, a_2, \cdots, a_n)$

$A \cup B$

$A \cap B$

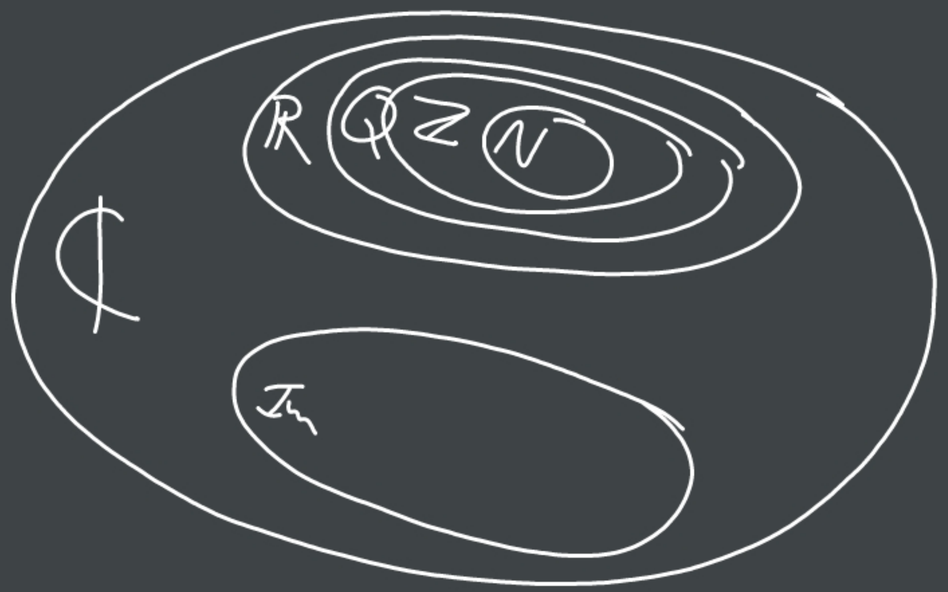
ϕ



2) Examples:

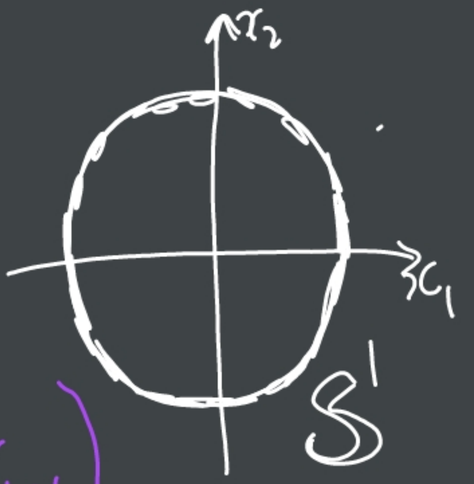
- $\mathbb{Z} = \{-4, -3, \dots, 0, 1, 2, 3, \dots\}$
- $\mathbb{N} = \{1, 2, 3, \dots,\}$
- $\mathbb{R} = (-\infty, \infty)$
- $\mathbb{R}_+ := \{x \in \mathbb{R} \mid x > 0\} \subset \mathbb{R}$

- $\mathbb{Z}_+ := \{0, 1, 2, 3, \dots\}$
  $:= \mathbb{N} \cup \{0\}$
- $\mathbb{Q} := \{x \in \mathbb{R} \mid \exists p \in \mathbb{Z}, q \in \mathbb{Z} \setminus \{0\}, x = \frac{p}{q}\}$



- $S^1 := \{ (x_1, x_2) \in \mathbb{R}^2 \mid x_1^2 + x_2^2 = 1 \}$

1-sphere
unit circle



- $S^n := \{ (x_1, \dots, x_{n+1}) \in \mathbb{R}^{n+1} \mid \sum_{i=1}^{n+1} x_i^2 = 1 \} \ni (x_1, \dots, x_{n+1})$

n-sphere

- $S^n := \underbrace{S \times \dots \times S}_{n\text{-times}} \ni (S_1, \dots, S_n)$

Cartesian Product of S

$$\mathbb{T}^n := \underbrace{S^1 \times \cdots \times S^1}_{n\text{-times}} \overset{?}{\neq} S^n$$

$\mathbb{T}^n$: n-torus