

Numbers: The Real Number Line

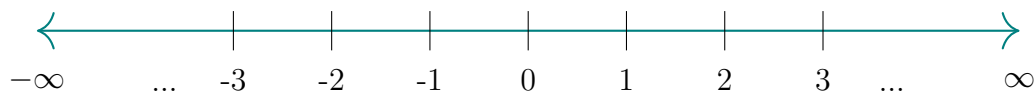
Video companion

1 Introduction

- What is \mathbb{R} ?
- Positive, negative
- Absolute value

2 Integers and rational numbers

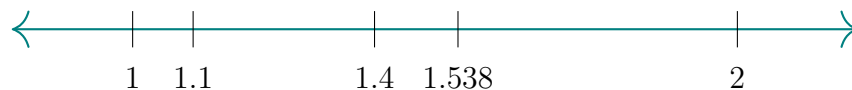
Graph of \mathbb{R} , the real numbers:



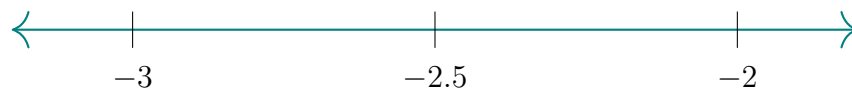
Subset of real numbers, integers:

$$\mathbb{Z} = \{\dots, -3, -2, -1, 0, 1, 2, 3, \dots\}$$

Segment between 1 and 2:



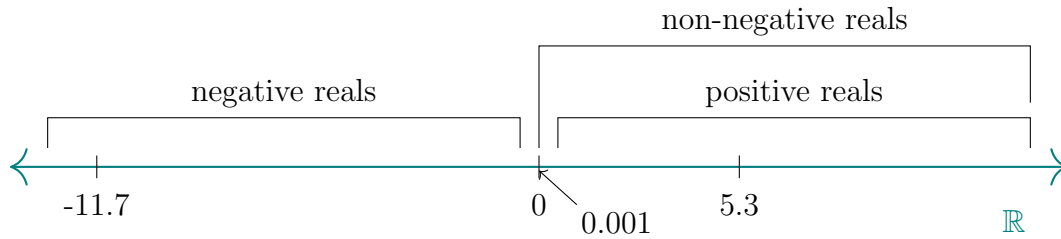
Segment between -3 and -2:



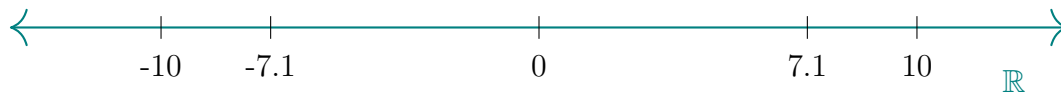
Some real numbers terminate, and some do not.

The number $\pi \approx 3.14159\dots$ is *irrational*, i.e. it does not repeat after the decimal point.

3 Sets of real numbers



4 Absolute value



The absolute value of a number x , $|x|$, is the distance from x to 0.

Example:

$$\begin{aligned} |7.1| &= 7.1 \\ |-7.1| &= 7.1 = -(-7.1) \end{aligned}$$

General rule:

For any $x \in \mathbb{R}$,

$$|x| = \begin{cases} x, & \text{if } x \text{ is non-negative} \\ -x, & \text{if } x \text{ is negative} \end{cases}$$

Check:

$$\begin{aligned} |8.7| &= 8.7 \\ |-10| &= -(-10) = 10 \end{aligned}$$