

# Numbers: The Real Number Line

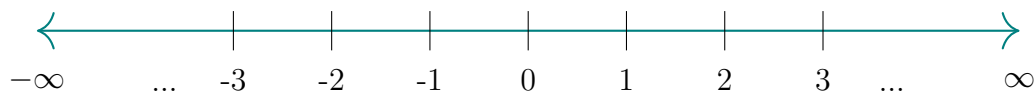
Video companion

## 1 Introduction

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

## 2 Integers and rational numbers

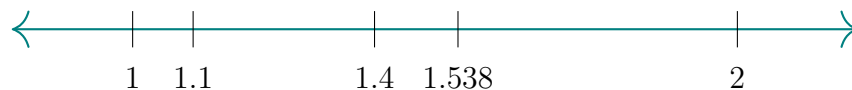
Graph of  $\mathbb{R}$ , the real numbers:



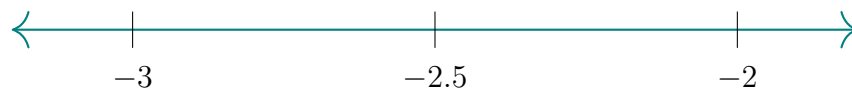
Subset of real numbers, integers:

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

Segment between 1 and 2:



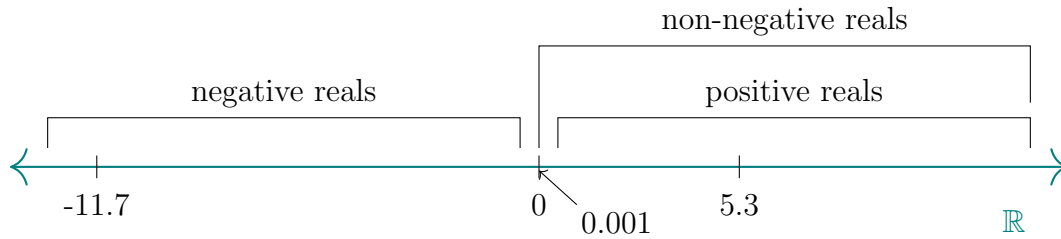
Segment between -3 and -2:



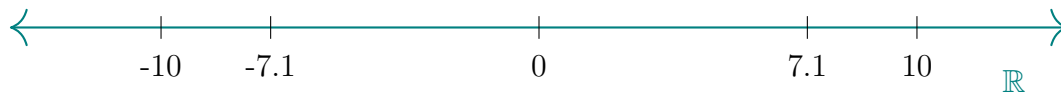
Some real numbers terminate, and some do not.

The number  $\pi = 3.14159\dots$  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:

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