



The Bright Side of Mathematics

Real Analysis - Part 1

Calculus, analysis, infinitesimal calculus,...

Goal: Understanding differential and integral calculations

$$\left. \begin{array}{l} \frac{df}{dx} \\ \int_a^b f dx \end{array} \right\}$$

Topics: Limits, continuity, derivatives, integrals.

Foundation: Real numbers: $\mathbb{R} \rightsquigarrow$ Start Learning Mathematics
 \hookrightarrow Start Learning Reals

Axioms of the reals: A non-empty set \mathbb{R} together with operations $+$, \cdot and ordering \leq is called the real numbers if it satisfies:

(A) $(\mathbb{R}, +, 0)$ is an abelian group

(M) $(\mathbb{R} \setminus \{0\}, \cdot, 1)$ is an abelian group ($1 \neq 0$)

(D) distributive law $x \cdot (y + z) = x \cdot y + x \cdot z$

(O) \leq is a total order, compatible with $+$ and \cdot , Archimedean property

(C) Every Cauchy sequence is a convergent sequence. $|x| := \begin{cases} x & \text{if } x \geq 0 \\ -x & \text{if } x < 0 \end{cases}$

Absolute value:

$$|x \cdot y| = |x| \cdot |y|$$

$$|x + y| \leq |x| + |y|$$

