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Types of discontinuities of functions on $\mathbb{R}$

Definition. Types of discontinuities of functions from a metric space to $\mathbb{R}$

Let X be a metric space, $f : X \to \mathbb{R}$ and $p \in (a, b)$. A discontinuity of f at p is called

- **simple discontinuity** if both $\lim_{x \to p+} f$ and $\lim_{x \to p-} f$ exists
  - **jump discontinuity** if $\lim_{x \to p+} f \neq \lim_{x \to p-} f$
  - **removable discontinuity** if $\lim_{x \to p+} f = \lim_{x \to p-} f \neq f(p)$
- **essential discontinuity** if one of $\lim_{x \to p+} f, \lim_{x \to p-} f$ does not exist
  - $\lim_{x \to p+} f$ does not exist, but $\lim_{x \to p-} f$ exists
  - $\lim_{x \to p+} f$ exists, but $\lim_{x \to p-} f$ does not exist
  - neither $\lim_{x \to p+} f$ not $\lim_{x \to p-} f$ exists

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- stamp stamp
  - Rf subobjects of and functions on $\mathbb{R}^n, T^n, S^n, \mathbb{C}^n$
    - R1
      - discont types Types of discontinuities of functions on $\mathbb{R}$

And it has 5 siblings.

- stamp stamp
  - Rf subobjects of and functions on $\mathbb{R}^n, T^n, S^n, \mathbb{C}^n$
    - R1
      - discont types Types of discontinuities of functions on $\mathbb{R}$
      - extremum Extremum of functions $\mathbb{R} \to \mathbb{R}$

- fixed pts Fixed points of functions $U \subseteq \mathbb{R} \to U$
- limit of fractions $\lim_{x \to a} \frac{f(x)}{g(x)}$ of functions $f, g : U \subseteq \mathbb{R} \to \mathbb{R}$
- Var and sequence of functions Total variation and sequence of continuous functions