

Assignment 4 - Limits

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1. Define

- $\lim_{x \rightarrow a} f(x)$
- $\lim_{x \rightarrow a^+} f(x)$
- $\lim_{x \rightarrow a^-} f(x)$
- $\lim_{x \rightarrow \infty} f(x)$

2. Let $f : \mathbb{R} \rightarrow \mathbb{R}$ be a function defined by

$$f(x) = \begin{cases} 1 & \text{if } x \geq 0 \\ 0 & \text{if } x < 0 \end{cases}$$

Prove that $\lim_{x \rightarrow 0} f(x)$ does not exist.

3. Prove $\lim_{x \rightarrow a} \frac{x^3+3x-2}{x^2+1} = \frac{a^3+3a-2}{a^2+1}$.