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Limites Laterais

① $h(x) = \begin{cases} \dfrac{x}{|x|}, & se \ x \neq 0 \\ 0, & se \ x = 0 \end{cases}$

* $\lim\limits_{x>0} h(x) = \lim\limits_{x \to 0^+} \dfrac{|x|}{x} = \lim\limits_{x \to 0^+} \dfrac{x}{x} = 1 \ //$

   * $\dfrac{|x|}{x}$ quando $x > 0 \Rightarrow |x| = x$

* $\lim\limits_{x<0} h(x) = \lim\limits_{x \to 0^-} \dfrac{|x|}{x} = \lim\limits_{x \to 0^-} \dfrac{-x}{x} = -1 \ //$

   * $\dfrac{|x|}{x}$ quando $x<0 \Rightarrow |x| = -x$

Como $\lim\limits_{x \to 0^+} h(x) \neq \lim\limits_{x \to 0^-} h(x)$, então não

existe limite no ponto 0.

② $g(x) = \begin{cases} \dfrac{|x-3|}{x-3}, & \text{se } x \neq 3 \\ 0, & \text{se } x = 3 \end{cases}$

$|x-3| = \begin{cases} -(x-3), & \text{se } x < 3 \\ (x-3), & \text{se } x \geq 3 \end{cases}$

⋆ $\displaystyle\lim_{x \to 3^+} g(x) = \frac{(x-3)}{x-3} = 1 \;//$

⋆ $\displaystyle\lim_{x \to 3^-} g(x) = \frac{-(x-3)}{x-3} = -1 \;//$

⋆ $\displaystyle\lim_{x \to 3} g(x) = \nexists$

③ $l(x) = \begin{cases} x+3, & \text{se } x < -3 \\ \sqrt{9-x^2}, & \text{se } -3 \leq x \leq 3 \\ 5-x, & \text{se } x > 3 \end{cases}$

a) $\displaystyle\lim_{x \to 3} l(x) = ?$

⋆ $\displaystyle\lim_{x \to 3^+} l(x) = \lim_{x \to 3^+}(5-x) = 5-3 = 2 \;//$

⋆ $\displaystyle\lim_{x \to 3^-} l(x) = \lim_{x \to 3^-}\sqrt{9-x^2} = \sqrt{9-9} = 0 \;//$

⋆ $\displaystyle\lim_{x \to 3} l(x) = \nexists$

b-) $\lim\limits_{x \to -3} l(x) = ?$

* $\lim\limits_{x > -3, \; x \to -3^+} l(x) = \lim\limits_{x \to -3^+} \sqrt{9-x^2} = \sqrt{0} = 0 //$

* $\lim\limits_{x < 3 \;\; x \to -3^-} l(x) = \lim\limits_{x \to -3^-} x+3 = -3+3 = 0 //$

* $\lim\limits_{x \to 3} l(x) = 0 //$

④ $\lim\limits_{x \to 1} \dfrac{l(x) - l(1)}{x-1}$, $l(x) = \begin{cases} x^2, \text{ se } x \neq 1 \\ 2x-1, \text{ se } x > 1 \end{cases}$

* $\lim\limits_{x \to 1^-} \dfrac{x^2-1}{x-1} = \lim\limits_{x \to 1^-} \dfrac{(x-1)(x+1)}{(x-1)} = 2 //$

$x < 1$

* $\lim\limits_{x \to 1^+} \dfrac{(2x-1)-(1)}{x-1} = \lim\limits_{x \to 1^+} \dfrac{2(x-1)}{(x-1)} = 2 //$

$x > 1$

* $\lim\limits_{x \to 1} \dfrac{l(x)-l(1)}{(x-1)} = 2 //$