

# Cálculo 1 - Terceira Lista de Exercícios

## Cálculo de Limites

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August 29, 2017

1. Calcule os limites

(a)

$$\lim_{x \rightarrow -4} \frac{x^2 - 16}{x + 4},$$

(b)

$$\lim_{x \rightarrow 0} \frac{(x + 4)^2 - 16}{x},$$

(c)

$$\lim_{x \rightarrow 3} \frac{x^2 - 9}{x^2 - 3x},$$

(d)

$$\lim_{x \rightarrow 2} \frac{x^4 - 16}{x - 2},$$

(e)

$$\lim_{x \rightarrow -2} \frac{8 + x^3}{4 - x^2},$$

(f)

$$\lim_{x \rightarrow 1} \frac{x^3 - 1}{x - 1},$$

(g)

$$\lim_{x \rightarrow 2} \frac{x^4 - 16}{8 - x^3}.$$

(h)

$$\lim_{x \rightarrow -10} \frac{x^2 + 7x - 30}{2x^2 + 21x + 10},$$

(i)

$$\lim_{x \rightarrow 1} \frac{2x^3 + x^2 - 4x + 1}{x^3 - 3x^2 + 5x - 3},$$

(j)

$$\lim_{x \rightarrow 1} \frac{x^3 - 3x + 2}{x^4 - 4x + 3},$$

(a)

$$\lim_{x \rightarrow 3} \frac{\sqrt{x+1} - 2}{x - 3},$$

(b)

$$\lim_{x \rightarrow 1} \frac{\sqrt{x+3} - 2}{x - 1},$$

(c)

$$\lim_{x \rightarrow 1} \frac{3 - \sqrt{10-x}}{x^2 - 1},$$

(d)

$$\lim_{x \rightarrow 2} \frac{x^2 - 4}{\sqrt{x+2} - \sqrt{3x-2}},$$

(e)

$$\lim_{x \rightarrow 5} \frac{\sqrt{2x+7} - \sqrt{17}}{x - 5},$$

(f)

$$\lim_{x \rightarrow 2} \frac{\sqrt{3x+8} - \sqrt{14}}{\sqrt{-2x+8} - 2},$$

(g)

$$\lim_{x \rightarrow 2} \frac{\sqrt[3]{5x-2} - 2}{\sqrt{x-1} - 1},$$

(h)

$$\lim_{x \rightarrow 16} \frac{\sqrt{x} - 4}{\sqrt[3]{x} - \sqrt[3]{16}}.$$

(i)

$$\lim_{x \rightarrow 1} \frac{\sqrt{5x+4} - 3}{\sqrt[3]{x-2} + 1},$$

(j)

$$\lim_{x \rightarrow 1} \frac{\sqrt[3]{x} - 1}{\sqrt[4]{x} - 1},$$

(k)

$$\lim_{x \rightarrow 0} \frac{1 - \sqrt{1 - x^2}}{x^2},$$

(l)

$$\lim_{x \rightarrow 0} \frac{(x + 1)^3 - 1}{x},$$

(m)

$$\lim_{x \rightarrow 5} \frac{\sqrt{x} - \sqrt{5}}{x - 5},$$

(n)

$$\lim_{x \rightarrow 2} \frac{x^2 - 3x + 2}{x^2 - 6x + 8},$$

(o)

$$\lim_{x \rightarrow 4} \frac{\sqrt{3x - 8} - 2}{\sqrt{x - 2} - \sqrt{2}},$$

(p)

$$\lim_{x \rightarrow 1} \frac{x^3 - 1}{x - 1},$$

(q)

$$\lim_{x \rightarrow 1} \frac{\sqrt[3]{x} - 1}{x - 1},$$

(r)

$$\lim_{x \rightarrow 5^+} \frac{|2x - 10|}{2x - 10},$$

(s)

$$\lim_{x \rightarrow 5^-} \frac{|2x - 10|}{2x - 10}.$$

2. Seja  $f : \mathbb{R} \rightarrow \mathbb{R}$  tal que

$$f(x) = \begin{cases} 1 - x^2, & \text{se } x < 3 \\ 0, & \text{se } x = 3 \\ \sqrt{7x + 2} - \sqrt{23} - 9, & \text{se } x > 3. \end{cases}$$

Obtenha

$$\lim_{x \rightarrow 3^-} f(x), \quad \lim_{x \rightarrow 3^+} f(x)$$

e discuta a existência de

$$\lim_{x \rightarrow 3} f(x).$$

3. Seja  $f : \mathbb{R} \rightarrow \mathbb{R}$  onde

$$f(x) = \begin{cases} 5x^2 + 2, & \text{se } x < 1 \\ 3, & \text{se } x = 1 \\ x^2 - ax + 4, & \text{se } x > 1. \end{cases}$$

Obtenha  $a \in \mathbb{R}$  tal que  $\lim_{x \rightarrow 1} f(x)$  exista e calcule o seu valor.

4. Seja  $f : \mathbb{R} \rightarrow \mathbb{R}$  onde

$$f(x) = \begin{cases} \frac{x^2 - 2x - 15}{x - 5}, & \text{se } x < 5 \\ 0, & \text{se } x = 5 \\ -2x^2 + ax + 7, & \text{se } x > 5. \end{cases}$$

Obtenha  $a \in \mathbb{R}$  tal que  $\lim_{x \rightarrow 5} f(x)$  exista e calcule o seu valor.

5.

6. Seja  $f : \mathbb{R} \rightarrow \mathbb{R}$  onde

$$f(x) = \begin{cases} \frac{x^2 + ax - 4}{x + 1}, & \text{se } x < -1 \\ 12, & \text{se } x = -1 \\ 3x^2 + bx + 1, & \text{se } x > -1. \end{cases}$$

Obtenha  $a \in \mathbb{R}$  e  $b \in \mathbb{R}$  tais que  $\lim_{x \rightarrow -1} f(x)$  exista e calcule o seu valor.

7. Seja  $f : \mathbb{R} \setminus \{5/7\} \rightarrow \mathbb{R}$  tal que

$$f(x) = \frac{7x - 5}{|5 - 7x|}.$$

Esboce o gráfico de  $f$  e calcule

$$\lim_{x \rightarrow 5/7^+} f(x) \text{ e } \lim_{x \rightarrow 5/7^-} f(x).$$

8. Seja  $f : \mathbb{R} \setminus \{3\} \rightarrow \mathbb{R}$  tal que

$$f(x) = \frac{x^2 - x - 6}{|x - 3|}.$$

Esboce o gráfico de  $f$  e calcule

$$\lim_{x \rightarrow 3^+} f(x) \text{ e } \lim_{x \rightarrow 3^-} f(x).$$

9. Seja  $f : \mathbb{R} \setminus \{5\} \rightarrow \mathbb{R}$  tal que

$$f(x) = \frac{|x^2 - 6x + 5|}{x - 5}.$$

Esboce o gráfico de  $f$  e calcule

$$\lim_{x \rightarrow 5^+} f(x) \text{ e } \lim_{x \rightarrow 5^-} f(x).$$

10. Seja  $f : \mathbb{R} \setminus \{-1, -4\} \rightarrow \mathbb{R}$  tal que

$$f(x) = \frac{|x^2 + x - 12|}{x^2 + 5x + 4}.$$

Esboce o gráfico de  $f$  e calcule

$$\lim_{x \rightarrow -4^+} f(x) \text{ e } \lim_{x \rightarrow -4^-} f(x).$$

11. Seja  $f : \mathbb{R} \setminus \{2\} \rightarrow \mathbb{R}$  tal que

$$f(x) = \frac{x^3 - 6x^2 + 11x - 6}{|x - 2|}.$$

Esboce o gráfico de  $f$  e calcule

$$\lim_{x \rightarrow 2^+} f(x) \text{ e } \lim_{x \rightarrow 2^-} f(x).$$

12. Calcule os limites

(a)

$$\lim_{x \rightarrow 0} \frac{\text{sen}(10x)}{x},$$

(b)

$$\lim_{x \rightarrow 0} \frac{\text{sen}(12x)}{\text{sen}(15x)},$$

(c)

$$\lim_{x \rightarrow 0} \frac{\tan(5x)}{\tan(11x)},$$

(d)

$$\lim_{x \rightarrow 0} \frac{1 - \cos x}{x \text{sen} x},$$

(e)

$$\lim_{x \rightarrow 0} \frac{\text{sen } ax}{\text{sen } bx},$$

onde  $a, b \in \mathbb{R}$ , e  $a, b \neq 0$ .

(f)

$$\lim_{x \rightarrow x_0} \frac{\cos x - \cos x_0}{x - x_0},$$

onde  $x_0 \in \mathbb{R}$ .

(g)

$$\lim_{x \rightarrow x_0} \frac{\tan x - \tan x_0}{x - x_0},$$

onde  $x_0 \in \mathbb{R}$ .

(h)

$$\lim_{x \rightarrow \frac{\pi}{4}} \frac{\operatorname{sen} x - \cos x}{1 - \tan x}.$$

(i)

$$\lim_{x \rightarrow x_0} \frac{\sec x - \sec x_0}{x - x_0},$$

onde  $x_0 \in \mathbb{R}$ .

(j)

$$\lim_{x \rightarrow 0} \frac{\tan x - \operatorname{sen} x}{\operatorname{sen}^2 x},$$

(k)

$$\lim_{x \rightarrow 0} \frac{\cos 2x - \cos 3x}{x^2},$$

(l)

$$\lim_{x \rightarrow 1} \frac{1 - x^2}{\operatorname{sen} \pi x},$$

(m)

$$\lim_{x \rightarrow 1} \frac{\cos(\pi/2x)}{1 - x},$$

(n)

$$\lim_{x \rightarrow 0} \frac{1 - \cos^3 x}{\operatorname{sen}^2 x},$$

(o)

$$\lim_{x \rightarrow 0} \frac{\sqrt{1 + \operatorname{sen} x} - \sqrt{1 - \operatorname{sen} x}}{x},$$

(p)

$$\lim_{x \rightarrow 0} x \cos(1/x),$$

(q)

$$\lim_{x \rightarrow 1} \frac{1 - x^2}{\operatorname{sen}(\pi x)},$$

(r)

$$\lim_{x \rightarrow \pi} \frac{1 - \operatorname{sen}(x/2)}{\pi - x},$$

(s)

$$\lim_{x \rightarrow 0} \frac{x^5 + 2x^3}{\tan(x) - \operatorname{sen}(x)}.$$