

Exercícios de Matemática 1 – Limites 0/0

Exercícios

$$a) \lim_{x \rightarrow 1} \frac{x^2 - 1}{x - 1} = \frac{1^2 - 1}{1 - 1} = \frac{0}{0}$$

$$\lim_{x \rightarrow 1} \frac{x^2 - 1}{x - 1} = \lim_{x \rightarrow 1} \frac{(x - 1)(x + 1)}{(x - 1)} =$$

$$a \cdot x^2 + bx + c = a \cdot (x - x_1) \cdot (x - x_2) \dots$$

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$$\lim_{x \rightarrow 1} (x+1) = 1+1 = 2$$

$$\lim_{x \rightarrow 1} \frac{x^2 - 1}{x - 1} = 2$$

$$b) \lim_{x \rightarrow 2} \frac{x^2 - 5x + 6}{x - 2} = \frac{2^2 - 5 \cdot 2 + 6}{2 - 2} = \frac{7}{0} = \text{undefined}$$

$$\lim_{x \rightarrow 2} \frac{x^2 - 5x + 6}{x - 2} = \frac{(x-3) \cdot (x-2)}{(x-2)} = \lim_{x \rightarrow 2} (x-3) = 2-3 = -1$$

$$\Delta = b^2 - 4 \cdot a \cdot c$$

$$\Delta = (-5)^2 - 4 \cdot 1 \cdot 6$$

$$\Delta = 25 - 24$$

$$\Delta = 1$$

$$x_{1,2} = \frac{-(-5) \pm \sqrt{1}}{2 \cdot 1} \Rightarrow \frac{5 \pm 1}{2} \Rightarrow x_1 = \frac{6}{2} = 3$$

$$\lim_{x \rightarrow 2} \frac{x^2 - 5x + 6}{x - 2} = -1$$

$$x_2 = \frac{4}{2} = 2$$

$$c) \lim_{x \rightarrow 1} \frac{x-1}{\sqrt{x}-1} = \frac{1-1}{\sqrt{1}-1} = \frac{0}{0}$$

$$\lim_{x \rightarrow 1} \frac{(x-1)}{(\sqrt{x}-1)} \cdot \frac{(\sqrt{x}+1)}{(\sqrt{x}+1)} = \frac{(x-1) \cdot (\sqrt{x}+1)}{(x-1)}$$

$$\lim_{x \rightarrow 1} (\sqrt{x}+1) = \sqrt{1}+1 = 2$$

$$\lim_{x \rightarrow 1} \frac{x-1}{\sqrt{x}-1} = 2$$

$$d) \lim_{x \rightarrow -1} \frac{x^2-1}{x^2+3x+2} = \frac{(-1)^2-1}{(-1)^2+3(-1)+2} = \frac{1-1}{1-3+2} = \frac{0}{0}$$

$$\lim_{x \rightarrow -1} \frac{x^2-1}{x^2+3x+2} = \lim_{x \rightarrow -1} \frac{(x-1)(x+1)}{(x+1)(x+2)} =$$

$$\lim_{x \rightarrow -1} \frac{(x-1)}{(x+2)} = \frac{(-1-1)}{(-1+2)} = \frac{-2}{1} = -2$$

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

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

$$\lim_{x \rightarrow 0} \frac{(4+x)^2-16}{x} = \lim_{x \rightarrow 0} \frac{16+8x+x^2-16}{x} =$$

$$\lim_{x \rightarrow 0} \frac{x^2+8x}{x} = \lim_{x \rightarrow 0} \frac{x(x+8)}{x} = \lim_{x \rightarrow 0} (x+8) = 0+8 = 8$$

$$(a+b)^4 = a^4 + 4a^3b + 6a^2b^2 + 4ab^3 + b^4$$

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$$f) \lim_{x \rightarrow 2} \frac{x^2 - 5x + 6}{x^2 - 12x + 20} = \frac{2^2 - 5 \cdot 2 + 6}{2^2 - 12 \cdot 2 + 20} = \frac{0}{0}$$

$$\lim_{x \rightarrow 2} \frac{(x-2)(x-3)}{(x-2)(x-10)} = \lim_{x \rightarrow 2} \frac{(x-3)}{(x-10)} = \frac{(2-3)}{(2-10)} = \frac{-1}{-8} = \frac{1}{8}$$

$$\lim_{x \rightarrow 2} \frac{x^2 - 5x + 6}{x^2 - 12x + 20} = \frac{1}{8}$$

$$g) \lim_{h \rightarrow 0} \frac{(2-h)^4 - 16}{h} = \frac{(2-0)^4 - 16}{0} = \frac{16 - 16}{0} = \frac{0}{0}$$

$$\lim_{h \rightarrow 0} \frac{2^4 + 4 \cdot 2^3 \cdot h + 6 \cdot 2^2 \cdot h^2 + 4 \cdot 2 \cdot h^3 + h^4}{h}$$

$$\lim_{h \rightarrow 0} \frac{16 + 32h + 24h^2 + 8h^3 + h^4 - 16}{h} =$$

$$\lim_{h \rightarrow 0} \frac{h(32 + 24h + 8h^2 + h^3)}{h} = 32 + 24h + 8h^2 + h^3$$

$$32 + 24 \cdot 0 + 8 \cdot 0^2 + 0^3 = 32$$

$$\lim_{h \rightarrow 0} \frac{(2+h)^4 - 16}{h} = 32$$

$$b) \lim_{t \rightarrow 0} \frac{\sqrt{25+3t}-5}{t} = \frac{\sqrt{25+3 \cdot 0}-5}{0} = \frac{5-5}{0} = \frac{0}{0}$$

$$\lim_{t \rightarrow 0} \frac{\sqrt{25+3t}-5}{t} \cdot \frac{(\sqrt{25+3t}+5)}{(\sqrt{25+3t}+5)} =$$

$$\lim_{t \rightarrow 0} \frac{25+3t-25}{t(\sqrt{25+3t}+5)} = \lim_{x \rightarrow 0} \frac{3 \cdot t}{t(\sqrt{25+3t}+5)} = \lim_{x \rightarrow 0} \frac{3}{\sqrt{25+3t}+5}$$

$$\lim_{x \rightarrow 0} \frac{3}{\sqrt{25+3t}+5} = \frac{3}{5+5} = \frac{3}{10}$$

$$\lim_{t \rightarrow 0} \frac{\sqrt{25+3t}}{t} = \frac{3}{10}$$

$$2) \lim_{x \rightarrow 0} \frac{\sqrt{1+x}-1}{-x} = \frac{\sqrt{1+0}-1}{-0} = \frac{\sqrt{1}-1}{0} = \frac{0}{0}$$

$$\lim_{x \rightarrow 0} \frac{\sqrt{1+x}-1}{-x} \cdot \frac{(\sqrt{1+x}+1)}{(\sqrt{1+x}+1)} =$$

$$\lim_{x \rightarrow 0} \frac{\sqrt{1^2+x^2}-1^2}{-x(\sqrt{1+x}+1)} = \lim_{x \rightarrow 0} \frac{1+x-1}{-x(\sqrt{1+x}+1)}$$

$$\lim_{x \rightarrow 0} \frac{x}{-x(\sqrt{1+x}+1)} = \lim_{x \rightarrow 0} \frac{1}{-(\sqrt{1+x}+1)}$$

$$\frac{1}{-(\sqrt{1+1}+1)} = \frac{1}{-(\sqrt{1}+1)} = \frac{1}{1+1} = \frac{1}{2}$$