

3) Calculo de limites

$$a) \lim_{x \rightarrow 1} (4x^2 - 7x + 5) \quad b) \lim_{x \rightarrow -3} \frac{x^2 + 2x - 3}{5 - 3x}$$

$$4(1)^2 - 7(1) + 5$$

$$4 - 7 + 5$$

$$a) = 2$$

$$\frac{(-3)^2 + 2(-3) - 3}{5 - 3(-3)}$$

$$\frac{9 + 6 - 3}{5 + 9}$$

$$\frac{9 - 3}{14} = \frac{6}{14}$$

$$b) = 0$$

$$c) \lim_{x \rightarrow 2} \left(\frac{3x^2 - 2x - 5}{-x^2 + 3x + 4} \right)^3$$

$$\left(\frac{3(2)^2 - 2(2) - 5}{-(2)^2 + 3(2) + 4} \right)^3$$

$$\left(\frac{12 - 4 - 5}{-4 + 6 + 4} \right)^3$$

$$\left(\frac{12 - 9}{4 - 10} \right)^3$$

$$\left(\frac{3}{-6} \right)^3$$

$$\left(\frac{1}{2} \right)^3$$

$$c) = \frac{1}{8}$$

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

$$\sqrt{\frac{2(-1)^2 + 3(-1) - 3}{5(-1) - 4}}$$

$$\sqrt{\frac{2 - 6}{-5}}$$

$$\sqrt{\frac{-4}{-5}}$$

$$\sqrt{\frac{4}{5}}$$

$$\frac{\sqrt{4}}{\sqrt{5}}$$

(d)

$$\frac{2}{\sqrt{5}}$$

$$8) \lim_{x \rightarrow 2} \sqrt{\frac{2x^2 + 3x + 2}{6 - 4x}}$$

$$\sqrt{\frac{2(2)^2 + 3(2) + 2}{6 - 4(2)}}$$

$$\sqrt{\frac{8 + 6 + 2}{6 - 8}}$$

$$= \sqrt{\frac{16}{-2}} = \frac{4}{-2} = -2$$

2) Calculate the limits above

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

$$\frac{(x+1) \cdot \cancel{(x-1)}}{\cancel{x-1}} = (x+1)(1+1) = 2$$

$$e) \lim_{x \rightarrow -2} \sqrt[3]{\frac{3x^3 - 5x^2 - x + 3}{4x + 3}}$$

$$\sqrt[3]{\frac{3(-2)^3 - 5(-2)^2 - (-2) + 3}{4(-2) + 3}}$$

$$\sqrt[3]{\frac{3(-8) - 5(4) + 2 + 3}{-8 + 3}}$$

$$\sqrt[3]{\frac{-24 - 20 + 5}{-5}}$$

$$\sqrt[3]{\frac{-39}{-5}}$$

$$b) = \sqrt[3]{\frac{39}{5}}$$

$$b) \lim_{x \rightarrow 2} \frac{4-x^2}{2+x}$$

$$\frac{(2-x)(2+x)}{(2+x)} \rightarrow (2-x) = (2-(2)) = 0$$

$$c) \lim_{x \rightarrow 0} \frac{2x^2 + 5x - 3}{2x^2 - 5x + 2}$$

$$2x^2 + 5x - 3 = 0$$

$$\frac{-5 \pm \sqrt{25 + 24}}{4}$$

$$\frac{-5 \pm 7}{4} = \begin{cases} \frac{2}{4} = \frac{1}{2} \\ -\frac{12}{4} = -3 \end{cases}$$

$$2x^2 - 5x + 2 = 0$$

$$\frac{5 \pm \sqrt{25 - 16}}{4}$$

$$\frac{5 \pm 3}{4} = \begin{cases} \frac{8}{4} = 2 \\ \frac{2}{4} = \frac{1}{2} \end{cases}$$

$$\lim_{x \rightarrow 0} \frac{(x+3) \left(\frac{x-\frac{1}{2}}{2} \right)}{(x+2) \left(\frac{x-\frac{1}{2}}{2} \right)}$$

$$\frac{\frac{1}{2} + 3}{2} = \frac{\frac{7}{2}}{2} = \frac{7}{4}$$

$$\frac{\frac{1}{2} - 2}{2} = \frac{-\frac{3}{2}}{2} = -\frac{3}{4}$$

$$\frac{7}{4} \cdot \frac{2}{-3} = -\frac{7}{6}$$

$$d) \frac{x^3 - 1 \rightarrow 0}{x^2 - 1 \rightarrow 0}$$

$$\lim_{x \rightarrow 1} \left(\frac{x^2 + x + 1}{x + 1} \right)$$

$$\frac{1^2 + 1 + 1}{1 + 1} = \frac{3}{2}$$

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

$$e) \lim_{x \rightarrow -2} \frac{8x^3 \rightarrow 0}{9x^2 \rightarrow 0}$$

$$\lim_{x \rightarrow -2} \left(\frac{(2+x) \cdot (4-2x+x^2)}{(2-x) \cdot (2+x)} \right)$$

$$\lim_{x \rightarrow -2} \left(\frac{x^2 - 2x + 4}{2-x} \right)$$

$$\lim_{x \rightarrow -2} \frac{(-2)^2 - 2(-2) + 4}{2 - (-2)} = 3$$

$$8) \lim_{x \rightarrow 1} \frac{x^3 - 3x^2 + 4x - 4 \rightarrow 0}{x^3 - 4x^2 + 8x - 5 \rightarrow 0}$$

$$\lim_{x \rightarrow 1} \left(\frac{x^3 - x^2 - 2x^2 + 2x + 4x - 4}{x^3 - x^2 - 3x^2 + 3x + 5x - 5} \right)$$

$$\lim_{x \rightarrow 1} \left(\frac{x^2 - 2x + 4}{x^2 - 3x + 5} \right)$$

$$1^2 = 2 \cdot 2 + 4 = 1$$

$$1^2 = 3 \cdot 1 + 5$$

$$3) a) \lim_{x \rightarrow 2} \frac{3x-4}{(x-2)^2}$$

$$\lim_{x \rightarrow 2} \left(\frac{3x-4}{(x-2)^2} \right) = +\infty$$

$$\lim_{x \rightarrow 2} \left(\frac{3x-4}{(x+2)^2} \right) = +\infty$$

$$b) \lim_{x \rightarrow 1} \frac{2x+3}{(x-1)^2} = \frac{2(1)+3}{(1-1)^2} = \frac{5}{0} = +\infty$$

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

$$d) \lim_{x \rightarrow 0} \frac{3x^2-5x+2}{x^2} = \frac{3(0)^2-5(0)+2}{0} = \frac{+2}{0} = +\infty$$

$$4) a) \lim_{x \rightarrow +\infty} (2x+3) \quad a > 0 \Rightarrow a=2 \quad m=1 \Rightarrow +\infty$$

$$b) (4-5x) \quad a < 0 \Rightarrow a=-5 \quad m=1 \Rightarrow +\infty$$

$$c) (5x^2-4x+3) \quad a > 0 \quad m < 2 \Rightarrow +\infty$$

$$d) \lim_{x \rightarrow +\infty} (4 - x^2)$$

$$x \rightarrow +\infty \quad a < 0 \Rightarrow a = -1 \quad m = -2 \Rightarrow -\infty$$

$$e) \lim_{x \rightarrow -\infty} (3x^3 - 4) \quad a > 0 \Rightarrow a = 3, n = 3 \Rightarrow -\infty$$

$$x \rightarrow -\infty$$

$$5) \lim_{x \rightarrow \infty} (3x^2 - 5x + 2) \quad a > 0 \Rightarrow a = 3, m = 2 \Rightarrow \infty$$

$$b) \lim_{x \rightarrow \infty} \left(\frac{-4x^3 + 7x}{2x^2 - 3x + 10} \right) = \lim_{x \rightarrow \infty} (-4x^3 + 7x) = +\infty$$

$$\lim_{x \rightarrow -\infty} (2x^2 - 3x + 10) = +\infty$$

$$c) \lim_{x \rightarrow \infty} \left(\frac{11x + 2}{2x^3 - 1} \right)$$

$$\lim$$

$$x \rightarrow \infty (11x + 2) \Rightarrow \infty$$

$$x \rightarrow \infty (2x^3 - 1) \Rightarrow \infty$$

$$\lim$$

$$x \rightarrow \infty \left(\frac{\frac{11}{x^2} + \frac{2}{x^3}}{2 - \frac{1}{x^3}} \right)$$

$$\frac{11 \cdot 0 + 2 \cdot 0}{2 - 0} = 0$$

$$d) \lim_{x \rightarrow +\infty} \left(\frac{x^3 + 3x + 1}{2x^2 + x + 1} \right)$$

lim

$$x \rightarrow +\infty (x^3 + 3x + 1) \rightarrow +\infty$$

lim

$$x \rightarrow +\infty (2x^2 + x + 1) \rightarrow +\infty$$

lim

$$x \rightarrow +\infty \left(\frac{x + \frac{3}{x} - \frac{1}{x^2}}{2 + \frac{1}{x} + \frac{1}{x^2}} \right) \rightarrow +\infty$$

$d = \infty$

$$e) \lim_{x \rightarrow +\infty} \left(\frac{2x+3}{5x+7} \right)$$

$$8) \lim_{x \rightarrow +\infty} \left(\frac{1 - 12x^3}{4x^2 + 12} \right)$$

$$\lim_{x \rightarrow +\infty} (2x+3) = +\infty$$

lim

$$x \rightarrow +\infty (1 - 12x^3) = -\infty$$

$$\lim_{x \rightarrow +\infty} (5x+7) = +\infty$$

lim

$$x \rightarrow +\infty (4x^2 + 12) = \infty$$

$$\lim_{x \rightarrow +\infty} \left(\frac{2 + \frac{3}{x}}{5 + \frac{7}{x}} \right)$$

$$\lim_{x \rightarrow +\infty} \left(\frac{\frac{1}{x^2} - 12x}{4 + \frac{12}{x^2}} \right)$$

$$\frac{2+3.0}{5+7.0} = \frac{2}{5}$$

Solucão = ∞

$$9) \lim_{x \rightarrow +\infty} \left(\frac{3x^2 - 6x}{4x - 8} \right) \quad \frac{3x \cdot 6x}{4 \cdot 8} = \lim_{x \rightarrow \infty} \frac{(3x+6)}{\frac{4-8}{x}} = \frac{\infty}{\frac{1}{4}}$$

Reducao do

$$1) \lim_{x \rightarrow +\infty} \left(\frac{-2x^3 - 2x + 3}{3x^3 + 3x^2 - 5x} \right) : x^3 = \frac{-2 - \frac{2}{x^2} + \frac{3}{x^3}}{3 + \frac{3}{x} - \frac{5}{x^2}}$$

$$\lim_{x \rightarrow +\infty} \left(\frac{-2 - \frac{2}{x^2} + 0}{3} \right) = -\frac{2}{3}$$

$$\lim_{x \rightarrow +\infty} 3 + \frac{3}{x} - \frac{5}{x^2}$$

Exercicios extras

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

$$x \rightarrow -1 \quad x^2 + 1$$

$$(-1)^3 + 1 = 0$$

$$(-1)^2 + 1$$

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

$$\lim_{x \rightarrow -1} (x^2 - 1) \rightarrow 0$$

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

$$x \rightarrow -1 \quad (x^2 + 3x + 2) \neq 0$$

$$x \rightarrow -1 \quad \left(\frac{x-1}{x+2} \right) = \frac{-1-1}{-1+2} = -2$$

$$c) \lim_{x \rightarrow -1} \frac{x^2 - 2x}{x^2 + 4x + 4}$$

$$\frac{(-1)^2 - 2 \cdot (-1)}{(-1)^2 - 4(-1) + 4} = \frac{1}{3}$$

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

$$\lim_{x \rightarrow 1} x^3 - 3x + 2 = 0$$

$$\lim_{x \rightarrow 1} x^3 - 4x + 3 = 0$$

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

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

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

$$f) \lim_{h \rightarrow 0} \frac{(x+h)^2 - x^2}{h}$$

$$h \rightarrow 0$$

$$\lim_{h \rightarrow 0} \frac{x^3 + 3x^2h + 3xh^2 + h^3 - x^3}{h}$$

$$\lim$$

$$h \rightarrow 0 \quad 3x^2 + 3x \cdot 0 + 0^2 = 3x^2$$

$$g) \lim_{x \rightarrow 1} \left[\frac{1}{1-x} - \frac{3}{1-x^3} \right] = \lim_{x \rightarrow 1} \left(\frac{1}{1-x} - \frac{3}{1-x^3} \right) = 0$$

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$$b) \lim_{x \rightarrow 1} \frac{\sqrt{x-1}}{x-1}$$

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

$$\lim_{x \rightarrow 1} (x-1) \rightarrow 0$$

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

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

$$x \rightarrow 1$$

$$\lim_{x \rightarrow 1} \sqrt[3]{x^3} - 2\sqrt[3]{x+1} \rightarrow 0$$

$$\lim_{x \rightarrow 1} (x-1)^2 \rightarrow 0$$

$$\lim_{x \rightarrow 1} \frac{1}{(\sqrt[3]{x^3} + \sqrt[3]{x+1})^2} = \frac{1}{9}$$

$$1) \lim_{x \rightarrow 16} \frac{\sqrt{x+8}}{\sqrt{x-4}}$$

$$\frac{\sqrt{64-0} = 8}{\sqrt{64-4}}$$