

## ATIVIDADE 4 - CÁLCULO I

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Turma: 07

1)

$$\textcircled{1} \lim_{x \rightarrow 1} \frac{\ln(x^2 - 2x + 2)}{\sqrt[6]{x^2 + 7} - x - 11} \Rightarrow \frac{\ln(x^2 - 2x + 2)}{6(x^2 + 7)^{5/3} - x - 11}$$

$$\ln(x^2 - 2x + 2) \Rightarrow \frac{1}{x^2 - 2x + 2} \cdot (x^2 - 2x + 2)' \Rightarrow \boxed{\frac{2x - 2}{x^2 - 2x + 2}}$$

$$6(x^2 + 7)^{5/3} - x - 11 \Rightarrow 6 \cdot \frac{1}{3} (x^2 + 7)^{2/3} \cdot (x^2 + 7)' \Rightarrow \frac{6(x^2 + 7)^{2/3} \cdot 2x}{3} - 1 \Rightarrow$$

$$\boxed{\frac{4x}{\sqrt[6]{(x^2 + 7)^2}} - 1}$$

$$\lim_{x \rightarrow 1} \frac{2x - 2}{x^2 - 2x + 2} \cdot \frac{\sqrt[6]{(x^2 + 7)^2}}{4x - \sqrt[6]{(x^2 + 7)^2}} \Rightarrow \boxed{\frac{0}{0}} \text{ indeterminado}$$

2-a)

$$2a) f(x) = -\frac{x^4}{4} + x^3 - x^2 \quad f'(x) = -x^3 + 3x^2 - 2x$$

$$f''(x) = -3x^2 + 6x - 2 \quad x = \frac{-6 \pm \sqrt{12}}{-6} \quad x' = \frac{-6 + 2\sqrt{3}}{-6} = \frac{3 - \sqrt{3}}{3}$$

$$\Delta = 36 - 4 \cdot (-3) \cdot (-2) \quad x'' = \frac{-6 - 2\sqrt{3}}{-6} = \frac{3 + \sqrt{3}}{3}$$

$$\Delta = 36 - 24$$

$$\Delta = 12$$

$$]-\infty, \frac{3 - \sqrt{3}}{3}[ \cup ] \frac{3 + \sqrt{3}}{3}, +\infty[$$

2-b)

$$2b) f'(x) = -x^3 + 3x^2 - 2x$$

$$x(-x^2 + 3x - 2) = 0$$

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

$$\Delta = 9 - 4 \cdot (-1) \cdot (-2)$$

$$\Delta = 1$$

$$x = \frac{-3 \pm \sqrt{1}}{-2}$$

$$x'' = \frac{-3+1}{-2} = 1$$

$$x''' = \frac{-3-1}{-2} = 2$$

$$\boxed{x' = 0}$$

$$\boxed{x'' = 1}$$

$$\boxed{x''' = 2}$$

$$f(0) = -0 + 0 - 0 \Rightarrow \boxed{f(0) = 0}$$

$$f(1) = \frac{-1}{4} + 1 - 1 \Rightarrow \boxed{f(1) = -\frac{1}{4}}$$

$$f(2) = \frac{-16}{4} + 8 - 4 \Rightarrow f(2) = -4 + 4 \Rightarrow \boxed{f(2) = 0}$$

6 ponto mínimo é  $-\frac{1}{4}$  e ocorre em  $x = 1$   
 6 ponto máximo é 0 e ocorre em  $x = 0$  e  $x = 2$

2-c)

$$2c) y - f(-1) = f'(-1) \cdot (x+1)$$

$$y + \frac{9}{4} = (1+3+2) \cdot (x+1)$$

$$y = 6x + 6 - \frac{9}{4} \Rightarrow \boxed{y = 6x + \frac{15}{4}}$$

2-d)

$$2d) f(x) = -\frac{x^4}{4} + x^3 - x^2$$

$$f\left(\frac{3-\sqrt{3}}{3}\right) = -\frac{\left(\frac{3-\sqrt{3}}{3}\right)^4}{4} + \left(\frac{3-\sqrt{3}}{3}\right)^3 - \left(\frac{3-\sqrt{3}}{3}\right)^2 \Rightarrow$$

$$-\frac{(3-\sqrt{3})^4}{324} + \frac{(3-\sqrt{3})^3}{27} - \frac{(3-\sqrt{3})^2}{9} \Rightarrow$$

$$\frac{252 - 144\sqrt{3}}{324} + \frac{54 - 30\sqrt{3}}{27} - \frac{12 - 6\sqrt{3}}{9} \Rightarrow$$

$$\frac{-252 + 144\sqrt{3} + 648 - 360\sqrt{3} - 432 + 216\sqrt{3}}{324} \Rightarrow \frac{-36}{324} \Rightarrow -\frac{1}{9}$$

$$f\left(\frac{3-\sqrt{3}}{3}\right) = \frac{-1}{9}$$

$$f\left(\frac{3+\sqrt{3}}{3}\right) = -\frac{\left(\frac{3+\sqrt{3}}{3}\right)^4}{4} + \left(\frac{3+\sqrt{3}}{3}\right)^3 - \left(\frac{3+\sqrt{3}}{3}\right)^2 \Rightarrow$$

$$-\frac{(3+\sqrt{3})^4}{324} + \frac{(3+\sqrt{3})^3}{27} - \frac{(3+\sqrt{3})^2}{9} \Rightarrow$$

$$\frac{-252 + 144\sqrt{3} + 54 + 30\sqrt{3} - 12 + 6\sqrt{3}}{324} \Rightarrow$$

$$\frac{-252 - 144\sqrt{3} + 54 + 30\sqrt{3} - 12 - 6\sqrt{3}}{324} \Rightarrow \frac{-210 - 120\sqrt{3}}{324} \Rightarrow \frac{-35 - 20\sqrt{3}}{54}$$

$$f\left(\frac{3+\sqrt{3}}{3}\right) = \frac{-35 - 20\sqrt{3}}{54}$$



3)

$$3) P = 12 \text{ cm} \quad A = 9 \text{ cm}^2 \quad l = 3 \text{ cm} \quad P_v = \frac{16 \text{ cm}}{\text{min}} \quad l = \frac{4 \text{ cm}}{\text{min}}$$

$$A = l^2$$

$$\frac{dA}{dt} = 2l \cdot \frac{dl}{dt}$$

$$\frac{dA}{dt} = 2 \cdot 3 \cdot 4 \Rightarrow 24 \text{ cm}^2/\text{min}$$

4)

$$4) V_R = A_b \cdot h = 108 \text{ m}^3 \quad A_b = l^2 \quad A_T = l^2 + 4lh$$

$$V_R = l^2 \cdot h = 108 \text{ m}^3 \quad A_R = lh$$

$$h = \frac{108}{l^2}$$

$$A_T = l^2 + 4lh \Rightarrow A_T = l^2 + 4 \cdot \frac{108}{l} \Rightarrow A_T = \frac{l^3 + 432}{l}$$

$$A_T = l^2 + 432 l^{-1} \Rightarrow A'_T = 2l + (-1) \cdot 432 l^{-2} \Rightarrow A'_T = \frac{2l^3 - 432}{l^2} \Rightarrow A'_T = \frac{2l^3 - 432}{l^2}$$

$$A'_T = 0$$

$$\frac{2l^3 - 432}{l^2} = 0 \Rightarrow 2l^3 - 432 = 0 \Rightarrow 2l^3 = 432 \Rightarrow l = \sqrt[3]{216} \Rightarrow l = 6 \text{ m}$$

$$A''_T = 2 \cdot 1 - (-2) \cdot 432 \cdot l^{-3} \Rightarrow A''_T = 2 + 864 l^{-3} \Rightarrow A''_T(6) = \frac{2 + 864}{216} \Rightarrow A''_T(6) = 6$$

$$h = \frac{108}{l^2} \Rightarrow h = \frac{108}{36} \Rightarrow h = 3 \text{ m}$$