

Primeira fase:

Fase Classificatória

1. $f(x) = x^\pi + \frac{2}{3}x^{4/5} - e^3$

$$f'(x) = \pi x^{\pi-1} + \frac{8}{15}x^{-1/5}$$

2. $f(x) = (\operatorname{tg}(x) + e^x) \cos(x)$

$$f'(x) = (\sec^2(x) + e^x) \cos(x) - (\operatorname{tg}(x) + e^x) \operatorname{sen}(x)$$

3. $f(x) = \left(\cos^2\left(\frac{x}{2}\right) + \operatorname{sen}^2\left(\frac{x}{2}\right) \right) \ln(x)$

$$f'(x) = \frac{1}{x} \cdot \left(\cos^2\left(\frac{x}{2}\right) + \operatorname{sen}^2\left(\frac{x}{2}\right) \right)$$

4. $f(x) = \frac{x^{5/2} \cdot \sqrt{x}}{\operatorname{sen}(x)} = \frac{x^3}{\operatorname{sen} x}$

$$f'(x) = \frac{3x^2 \cdot \operatorname{sen}(x) - x^3 \cdot \cos(x)}{\operatorname{sen}^2(x)}$$

5. $f(x) = \sqrt{\ln(x^2 + \cos^4(x))}$

$$f'(x) = \frac{1}{2} (\ln(x^2 + \cos^4(x)))^{-1/2} \left(\frac{1}{x^2 + \cos^4(x)} 2x - 4 \cos^3(x) \cdot \operatorname{sen}(x) \right)$$

6. $f(x) = \ln\left(\frac{x^5}{\sqrt[3]{x}} - \pi\right) \cdot \sqrt{x^3}$

$$f'(x) = \left(\frac{1}{\frac{x^5}{\sqrt[3]{x}} - \pi} \cdot \sqrt{x^3} \cdot \frac{14}{3} \cdot x^{11/3} \right) + \ln(x^{14/3} - \pi) \cdot \frac{3}{2} x^{1/2}$$

7. $f(x) = \operatorname{sen}(\cos(x))$

$$f'(x) = -\cos(\cos(x)) \cdot \operatorname{sen}(x)$$

8. $f(x) = \sqrt{\frac{1}{x} + \sqrt{x}}$

$$f'(x) = \frac{1}{2} \left(\frac{1}{x} + x^{1/2} \right)^{-1/2} \cdot \left(-x^{-2} + \frac{1}{2} x^{-1/2} \right)$$

9. $f(x) = \left(\frac{1}{\operatorname{tg}(x)} + e \right)^{e^{5x}}$

$$\begin{aligned} f'(x) &= \left(\frac{1}{\operatorname{tg}(x)} + e \right)^{e^{5x}} \cdot \left[e^{5x} \ln\left(\frac{1}{\operatorname{tg}(x)} + e\right) \right]' \\ &= \left(\frac{1}{\operatorname{tg}(x)} + e \right)^{e^{5x}} \left[5e^{5x} \ln\left(\frac{1}{\operatorname{tg}(x)} + e\right) - \frac{e^{5x}}{\frac{1}{\operatorname{tg}(x)} + e} \left(\frac{\sec^2(x)}{\operatorname{tg}^2(x)} \right) \right] \end{aligned}$$

$$10. f(x) = \sec(\cos(11x + 10)^{15})$$

$$f'(x) = \sec(\cos(11x + 10)^{15}) \operatorname{tg}(\cos(11x + 10)^{15}) \cdot (-\operatorname{sen}(11x + 10)^{15}) \cdot 15(11x + 10)^{14} \cdot 11$$