

### Trabalho 5 (10 pontos)

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1. Determine  $f'(x)$  sendo

(a) (2 pontos)

$$f(x) = \frac{e^x - e^{-x}}{2}$$

(b) (2 pontos)

$$f(x) = \ln(x^2 + 1) \cdot \operatorname{tg}^4(x) = \ln(x^2 + 1) \cdot (\operatorname{tg}x)^4$$

(c) (2 pontos)

$$f(x) = \frac{-x}{(2x - 1)^2}$$

2. (2 pontos) Seja  $f(x) = \operatorname{tg} x$  para todo  $-\frac{\pi}{2} < x < \frac{\pi}{2}$ , determine a derivada de sua função inversa.

3. (2 pontos) Calcule

$$\lim_{x \rightarrow \infty} \frac{x}{\ln(1 + 2e^x)}$$

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Aluna: Thaizelly Alvariza Nascimento 11921B51222

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1. Determine  $f'(x)$  usando

a)  $f(x) = \frac{e^x - e^{-x}}{2}$

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

$$f'(x) = 2 \left[ (e^x)' - (e^{-x})' \right] - 0 (e^x - e^{-x})$$

$$f'(x) = 2 \left[ e^x - e^{-x} \cdot (-x)^{-2} \right]$$

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

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

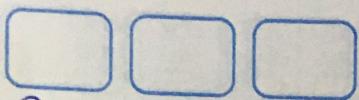
Resposta:  $\frac{1}{2} (e^x + e^{-x})$

b)  $f(x) = \ln(x^2 + 1) \cdot \operatorname{tg}^4(x) = \ln(x^2 + 1) \cdot (\operatorname{tg} x)^4$

$$f'(x) = (\ln(x^2 + 1))' \cdot (\operatorname{tg} x)^4 + (\ln(x^2 + 1)) \cdot ((\ln(x^2 + 1))' \cdot (\operatorname{tg} x)^4)$$

$$f'(x) = \left[ 1 \cdot (x^2 + 1)^{-1} \right] \cdot (\operatorname{tg} x)^4 + (\ln(x^2 + 1)) \cdot (2x \cdot \operatorname{tg}^2 x)$$

$$f'(x) = \left[ \frac{1}{(x^2 + 1)} \cdot 2x \right] \cdot (\operatorname{tg} x)^4 + (\ln(x^2 + 1)) \cdot (2 \cdot (\operatorname{tg} x)^3 \cdot \operatorname{sec}^2 x)$$



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$$g(x) = \begin{bmatrix} 2x \\ (x^2+1) \end{bmatrix} \cdot (\operatorname{tg} x)^3 + (\operatorname{Im}(x^2+1)) \cdot 3 \operatorname{sec}^2 x (\operatorname{tg} x)^3$$

$$g(x) = \frac{2x(\operatorname{tg} x)^4}{(x^2+1)} + 3 \operatorname{sec}^2 x (\operatorname{tg} x)^3 \operatorname{Im}(x^2+1)$$

Reescribir  $\frac{2x(\operatorname{tg} x)^4}{(x^2+1)} + 3 \operatorname{sec}^2 x (\operatorname{tg} x)^3 \operatorname{Im}(x^2+1)$

c)  $f(x) = \frac{-x}{(2x-1)^2}$

$$f'(x) = \frac{(2x-1)^2 \cdot (-x)^3 - (-x) \cdot [(2x-1)^2]^2}{((2x-1)^2)^2}$$

$$f'(x) = \frac{(2x-1)^2 \cdot (-1) + x \cdot [2u^2 \cdot (2x-1)^3]}{(2x-1)^4}$$

$$f'(x) = \frac{-(2x-1)^2 + x \cdot [2(2x-1) \cdot 3]}{(2x-1)^4}$$

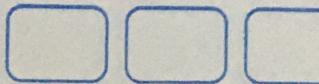
$$f'(x) = \frac{-(2x-1)^2 + x \cdot [6(2x-1)]}{(2x-1)^4}$$

$$f'(x) = \frac{-(2x-1)^2 + 12x(2x-1)}{(2x-1)^4}$$

$$f'(x) = \frac{-(2x-1)^2 + 8x^2 - 4x}{(2x-1)^4}$$

$$f'(x) = \frac{-(2x-1)^2 - 8x^2 + 4x}{(2x-1)^4}$$

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Resposta:  $\frac{(2x-1)^2 \cdot 8x^2 + 4x}{(2x-1)^4}$

2. Dada  $g(x) = \operatorname{tg} x$  para todo  $-\frac{\pi}{2} < x < \frac{\pi}{2}$ , determine a derivada de sua função inversa.

$$Dg^{-1}(x) = \frac{1}{g'(x)} = \frac{1}{\sec^2 x} = \frac{1}{1+y^2}$$

$$\operatorname{tg}^2 x + 1 = \sec^2 x$$

$$\sec^2 x = y^2 + 1$$

Resposta:  $\frac{1}{1+y^2}$

3. Calcule  $\lim_{x \rightarrow \infty} \frac{x}{\ln(1+2e^x)}$

$$\frac{(x)'}{(\ln(1+2e^x))'} = \frac{1}{(\ln u)'} = \frac{1}{1 \cdot (1+2e^x)'} = \frac{1}{1 \cdot (0+2e^x)}$$

$$= \frac{1}{1 \cdot 2e^x} = \frac{1 \cdot (1+2e^x)}{2e^x} = \frac{1+2e^x}{2e^x}$$

$$\Rightarrow \frac{(1+2e^x)'}{(2e^x)'} = \frac{0+2e^x}{2e^x} = \frac{1}{1}$$

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Resposta: 1