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Lista 1

Slide 20:

$$2) f(x) = \sqrt{x} \sin x$$

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

$$\Rightarrow f'(x) = \frac{\sin x}{2\sqrt{x}} + \sqrt{x} \cdot \cos x$$

$$3) f(x) = \sin x + \frac{1}{2} \cot x$$

$$f'(x) = \cos x - \frac{\cos \sec^2 x}{2}$$

$$4) y = 2 \sec x - \cos \sec x$$

$$y' = 2 \sec x \cdot \tan x - (-\cos \sec x \cdot \cot x)$$

$$5) g(t) = t^3 \cos t$$

$$g'(t) = 3t^2 \cdot \cos t + t^3 \cdot (-\sin t)$$

$$g'(t) = 3t^2 \cdot \cos t - t^3 \sin t$$

$$8) y = e^u (\cos u + cu)$$

$$y' = e^u \cdot (\cos u + cu) + e^u \cdot (-\sin u + c)$$

$$9) y = \frac{x}{2 - \tan x}$$

$$y' = \frac{(2 - \tan x) - x \cdot (-\sec^2 x)}{(2 - \tan x)^2} \Rightarrow y' = \frac{2 - \tan x + x \sec^2 x}{(2 - \tan x)^2}$$



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$$12) y = \frac{\cos x}{1 - \sin x}$$

$$y' = \frac{-\sin x \cdot (1 - \sin x) - \cos x \cdot (-\cos x)}{(1 - \sin x)^2}$$

$$y' = \frac{(-\sin x + \sin^2 x) + \cos^2 x}{(1 - \sin x)^2}$$

$$14) y = \frac{1 - \sec x}{\tan x}$$

$$y' = \frac{-\sec x \cdot \tan x \cdot \tan x - (1 - \sec x) \cdot \sec^2 x}{\tan^3 x}$$

$$y' = \frac{-\sec x \cdot \tan^2 x - (1 - \sec x) \cdot \sec^2 x}{\tan^3 x}$$

$$15) f(x) = x e^x \operatorname{cosec} x$$

$$(e^x \operatorname{cosec} x)' = e^x \operatorname{cosec} x - e^x (\operatorname{cosec} x \cot x)$$

$$f'(x) = e^x \operatorname{cosec} x + x \cdot (e^x \operatorname{cosec} x - e^x (\operatorname{cosec} x \cot x))$$

$$16) y = x^2 \sin x \tan x$$

$$(\sin x \tan x)' = \cos x \tan x + \sin x \cdot \sec^2 x$$

$$y' = 2x (\sin x \tan x) + x^2 (\cos x \tan x + \sin x \cdot \sec^2 x)$$



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Slide 25:

$$39) y = (2x+1)^5 (x^4-3)^6$$

$$\ln y = \ln((2x+1)^5 (x^4-3)^6) \Rightarrow \ln y = 5 \ln(2x+1) + 6 \ln(x^4-3) \Rightarrow$$

$$\Rightarrow \frac{1}{y} \cdot y' = 5 \cdot \frac{1}{2x+1} \cdot 2 + 6 \cdot \frac{1}{x^4-3} \cdot 4x^3 \Rightarrow y' = y \left( \frac{10}{2x+1} + \frac{24x^3}{x^4-3} \right) \Rightarrow y' = (2x+1)^5 (x^4-3)^6 \left( \frac{10}{2x+1} + \frac{24x^3}{x^4-3} \right)$$

$$40) y = \sqrt{x} \cdot e^{x^2} (x^2+1)^{10}$$

$$\ln y = \ln \sqrt{x} + \ln e^{x^2} + \ln(x^2+1)^{10} \Rightarrow \ln y = \frac{1}{2} \ln x + x^2 + 10 \ln(x^2+1) \Rightarrow$$

$$\Rightarrow \frac{1}{y} \cdot y' = \frac{1}{2} \cdot \frac{1}{x} + 2x + 10 \cdot \frac{1}{x^2+1} \cdot 2x \Rightarrow \frac{y'}{y} = \frac{1}{2x} + 2x + \frac{20x}{x^2+1} \Rightarrow$$

$$\Rightarrow y' = \sqrt{x} \cdot e^{x^2} \cdot (x^2+1)^{10} \cdot \left( \frac{1}{2x} + 2x + \frac{20x}{x^2+1} \right)$$

$$41) y = \sqrt{\frac{x-1}{x^4+1}}$$

$$\ln y = \ln \left( \frac{x-1}{x^4+1} \right)^{\frac{1}{2}} \Rightarrow \ln y = \frac{1}{2} \ln \left( \frac{x-1}{x^4+1} \right) \Rightarrow \frac{y'}{y} = \frac{1}{2} \cdot \frac{x^4 y}{x-1} \cdot \frac{x^3 \cdot (x-1) - (x^4+1)}{(x-1)^2}$$

$$\Rightarrow \frac{y'}{y} = \frac{x^4+1}{x^4+1} \cdot \frac{x^3 \cdot (x-1) - (x^4+1)}{2(x-1)^2} \Rightarrow y' = \sqrt{\frac{x-1}{x^4+1}} \cdot \left( x^3 \cdot \frac{(x-1) - (x^4+1)}{2(x-1)^2} \right)$$

$$49) y = (\tan x)^{\frac{1}{x}}$$

$$\ln y = \ln(\tan x)^{\frac{1}{x}} \Rightarrow \ln y = \frac{1}{x} \ln(\tan x) \Rightarrow \frac{y'}{y} = -x^{-2} \ln(\tan x) + \frac{1}{x} \cdot \frac{1}{\tan x} \cdot \sec^2 x$$

$$\Rightarrow y' = (\tan x)^{\frac{1}{x}} \cdot \left( -x^{-2} \ln(\tan x) + \frac{\sec^2 x}{x \tan x} \right)$$

$$50) y = (\ln x)^{\cos x}$$

$$\ln y = \ln(\ln x)^{\cos x} \Rightarrow \ln y = \cos x \cdot \ln(\ln x) \Rightarrow$$

$$\Rightarrow \frac{y'}{y} = -\sin x \cdot \ln(\ln x) + \cos x \cdot \frac{1}{\ln x} \cdot \frac{1}{x} \Rightarrow \frac{y'}{y} = -\sin x \cdot \ln(\ln x) + \frac{\cos x}{x \ln x} \Rightarrow$$

$$\Rightarrow y' = (\ln x)^{\cos x} \cdot \left( -\sin x \cdot \ln(\ln x) + \frac{\cos x}{x \ln x} \right)$$