

DERIVATE

$$1) x^2 = 2x$$

$$2) x^7 = 7x^6$$

$$3) x^{-2} = -2x^{-3}$$

$$4) x^n = n x^{n-1}$$

$$5) 4 = 0$$

$$6) \sqrt{x} = \frac{1}{2\sqrt{x}}$$

$$7) \sqrt[3]{x^2} = x^{\frac{2}{3}} = \frac{2}{3} x^{-\frac{1}{3}} = \frac{2}{3\sqrt[3]{x}}$$

$$8) 3^x = a^x = \ln(a) \cdot a^x \Rightarrow \ln(3) \cdot 3^x$$

$$9) \sin x + \cos x = \cos x - \sin x$$

$$10) e^x x^2 + \sin x = e^x \cdot x^2 + e^x \cdot 2x + \cos x \Rightarrow 2x e^x + x^2 e^x + \cos x$$

$$11) 2 \cos(3x) - \log x = -6 \sin(3x)$$

$$12) \frac{\tan x}{x^2 + 1} = \frac{\tan(x) \cdot (x^2 + 1) - \tan(x) \cdot (x^2 + 1)}{(x^2 + 1)^2} =$$

$$\frac{x^2 + 1 - \sin(2x) \cdot x}{\cos(x)^2 \cdot (x^2 + 1)^2}$$

$$13) \log \left(\frac{\sin x}{e^x} \right) =$$

$$\frac{\cos x \cdot e^x - \sin x \cdot e^x}{(e^x)^2} \Rightarrow \frac{e^x \cos x - e^x \sin x}{e^{2x}}$$

$$\log \left(\frac{e^x \cos x - e^x \sin x}{e^{2x}} \right) =$$

$$= \frac{1}{\frac{\sin x}{e^x}} \cdot \frac{e^x \cos x - e^x \sin x}{e^{2x}} \Rightarrow$$

$$\Rightarrow \frac{\cancel{e^x}}{\sin x} \cdot \frac{e^x \cos x - \cancel{e^x} \sin x}{\cancel{e^{2x}}} \Rightarrow$$

$$\Rightarrow \frac{1}{\sin x} \cdot \frac{e^x \cdot (\cos x - \sin x)}{e^x} \Rightarrow \frac{\cos x - \sin x}{\sin x}$$

$$\Rightarrow \frac{\cos x}{\sin x} - \frac{\sin x}{\sin x} \Rightarrow \boxed{\frac{\cos x}{\sin x} - 1}$$

$$14) -3x^2 + 3 = -6x$$

$$15) x^3 - 2\cos x + \frac{1}{2} = 3x^2 + 2\sin x$$

$$16) 2\sqrt{x} - \frac{1}{x} \Rightarrow 2 \cdot x^{1/2} - x^{-1} \Rightarrow 2 \cdot \frac{1}{2} x^{-1/2} + 1x^{-2} =$$

$$\boxed{\frac{1}{\sqrt{x}} + \frac{1}{x^2}}$$

$$17) 5x^3 \cdot e^x \Rightarrow 15x^2 \cdot e^x + 5x^3 \cdot e^x \Rightarrow$$

$$e^x 15x^2 + e^x 5x^3 \Rightarrow 5x^2 e^x (3 + x)$$

$$18) \frac{x^2}{2-x^3} \Rightarrow \frac{2x \cdot (2-x^3) - x^2 \cdot (-3x^2)}{(2-x^3)^2} \Rightarrow$$

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

$$19) \frac{\sin x}{x} \Rightarrow \frac{\cos x \cdot (x) - \sin x \cdot (1)}{x^2} \Rightarrow$$

$$\frac{x \cos x - \sin x}{x^2}$$

DERIVATE COMPOSITE

$$(g \circ f)'(x) = g'(f(x)) \cdot f'(x)$$

PER SEMPLIFICARE IL RAGIONAMENTO POSSIAMO RIDURRE LA SCRITTURA COME:

$$f(\square) = f'(\square) \cdot \square'$$

ESEMPIO:

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



$$\frac{1}{x^2+2} \cdot 2x \Rightarrow \frac{2x}{x^2+2}$$

E) E-121

$$1) (x^3-2x)^3 \Rightarrow 3(x^3-2x)^2 \cdot (3x^2-2)$$

$$2) e^{4x} \Rightarrow e^{4x} \cdot 4 \Rightarrow 4e^{4x}$$

$$3) \ln(x^2-1) + 5 \Rightarrow \frac{1}{x^2-1} \cdot 2x \Rightarrow \frac{2x}{x^2-1}$$

$$4) 3 \cos 4x \Rightarrow 3 \cdot (-\sin(4x) \cdot 4) \Rightarrow -12 \sin 4x$$

$$5) e^{\frac{2x}{x-1}} \Rightarrow e^{\frac{2x}{x-1}} \cdot \left[\frac{2 \cdot (x-1) - 2x \cdot 1}{(x-1)^2} \right] \Rightarrow$$

$$e^{\frac{2x}{x-1}} \cdot \left[\frac{2x-2-2x}{(x-1)^2} \right] \Rightarrow e^{\frac{2x}{x-1}} \cdot \left[-\frac{2}{(x-1)^2} \right]$$

$$\Rightarrow \frac{-2 e^{\frac{2x}{x-1}}}{(x-1)^2}$$

$$6) 4 \ln 3x + \ln x \Rightarrow 4 \cdot \left[\frac{1}{3x} \cdot 3 \right] + \frac{1}{x} \Rightarrow \frac{5}{x}$$

$$7) e^{x^2-2} \Rightarrow e^{x^2-2} \cdot 2x \Rightarrow 2xe^{x^2-2}$$

$$8) \ln(2x^2-x) \Rightarrow \frac{1}{2x^2-x} \cdot 4x-1 \Rightarrow \frac{4x-1}{2x^2-x}$$