Regra da Cadeia

$$(f(g(x)))' = f'(g(x)) \cdot g'(x)$$
$$= \frac{df(g(x))}{dg(x)} \cdot \frac{dg(x)}{dx}$$

ex (e^{nx}), n é cte.

$$\boxed{(e^{nx})' = e^{nx} \cdot n} \Rightarrow \boxed{\int e^{nx} = \frac{e^{nx}}{n}}$$

Lo $\left(\frac{e^{nx}}{n}\right)' = e^{nx}$

Regra do Produto

! Não vale $(uv)' = u' \cdot v'$

$$(u \cdot v)' = u'v + uv' \longrightarrow uv = \int u'v + \int uv'$$

$$\boxed{\int u'v = uv - \int uv'}$$

$$\overbrace{(x^2+2x)}^{u} \cdot \overbrace{\ln x}^{v}$$
$$= (2x+2) \cdot \ln x + (x^{\cancel{2}}+2\cancel{x}) \cdot \frac{1}{\cancel{x}} \quad (x \neq 0)$$
$$= 2(x+1)\ln x + (x+2)$$

Regra do Quociente

$$\boxed{\left(\frac{u}{v}\right)' = \frac{u'v - v'u}{v^2}}$$

$$\frac{e^x}{x}$$

$$\left(\frac{1}{x}\right)' = \frac{0 \cdot x - 1 \cdot 1}{x^2} = \frac{-1}{x^2}$$

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

e) $\int \underbrace{(1+x^2)}_{v} \underbrace{e^{-x}}_{u'} \, dx$

$\int u'v = uv - \int uv'$

$\int x^n = \frac{x^{n+1}}{n+1}$

$u = \frac{e^{-x}}{-1}$ | $v = 1 + x^2$

$u' = e^{-x}$ | $v' = 2x$

quero $= -e^{-x}(1+x^2) - \int -e^{-x} \cdot 2x \, dx$

(chute)

$\int e^{-x} = \frac{e^{-x}}{-1}$

$(e^{-x^{3/2}})' = e^{-x^{3/2+1}} \cdot (-1)$

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

$\int e^{-x} = \frac{e^{-x}}{-1}$

$= -e^{-x}(1+x^2) + 2 \int \underbrace{e^{-x}}_{u'} \cdot \underbrace{x}_{v} \, dx$

?

$y^2 + 1$

$? = -e^{-x} \cdot x + \int -e^{-x} \, dx$

$= -e^{-x} \cdot x + (-e^{-x})$

Voltando

$-e^{-x}(1+x^2) + 2\left(-e^{-x} \cdot x - e^{-x}\right)$

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

$\boxed{-e^{-x}(x^2 + 2x + 2)}$

d) $\int 3\underbrace{x}_{v}\underbrace{e^{4x}}_{u'}\,dx$

$$\underbrace{\int u'v} = uv - \int uv'$$

x^2+1

$\cancel{1x^2+0x+1}$

$v' = 1$

$u = \int e^{4x} = e^{4x}$

$(e^{4x})' = e^{4x}\cdot 4$

$$\boxed{\int e^{4x} = \frac{e^{4x}}{4}}$$

$$3\left[\frac{e^{4x}}{4}\cdot x - \int \frac{e^{4x}}{4}\,dx\right]$$

$$3\left[\frac{e^{4x}\cdot x}{4} - \frac{1}{4}\cdot\frac{e^{4x}}{4}\right]$$

$$= \frac{3e^{4x}}{4}\left(x - 1/4\right)$$

f) $\int_1^4 \underbrace{\sqrt{t}}_{u'}\,\underbrace{\ln t}_{v}\,dt$

$$\int u'v = uv - \overbrace{\int uv'}$$

$$n^a \cdot n^b = n^{a+b}$$
$$n^a / n^b = n^{a-b}$$

$$u = \int t^{1/2} = \frac{t^{1/2+1}}{1/2+1} = \frac{t^{3/2}}{3/2} = t^{3/2}\cdot\frac{2}{3} = \boxed{\frac{2t^{3/2}}{3}}$$

$$\text{bozuca} = \frac{2t^{3/2}}{3}\cdot \ln t - \int \frac{2t^{3/2}}{3}\cdot\frac{1}{t}\,dt$$

$$= \frac{2t^{3/2}\ln t}{3} - \frac{2}{3}\cdot\int t^{1/2}\cdot dt$$

$$= \frac{2t^{3/2}}{3}\cdot \ln t - \frac{2}{3}\cdot\frac{2}{3}\cdot t^{3/2}$$

$$= \frac{2}{3}t^{3/2}\left(\ln t - 2/3\right)$$

$$\sqrt{t^3} = \sqrt{t^2\cdot t} = t\sqrt{t}$$

$$t^1\cdot t^{1/2} = t\sqrt{t}$$

g) $\int_0^2 \overbrace{(x-2)}^{v}\overbrace{e^{-x/2}}^{u'}\,dx = -2e^{-x/2}(x-2) - \int -2e^{-x/2}\,dx$

$\int u'v = uv - \int uv'$

$= -2e^{-x/2}(x-2) + 2(-2e^{-x/2})$

$= -2e^{-x/2}\cdot x$

$\to (-2\cdot e^{-1}\cdot 2) - (0)$

$\to -\dfrac{4}{e}$

$v' = 1$

(chute)

$u = \int e^{-x/2} = \dfrac{e^{-x/2}}{\cancel{(-1/2)}}$

correção

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

$e\ 2,73$

certain ?

$u = \dfrac{e^{-x/2}}{-1/2} = e^{-x/2}\cdot\dfrac{2}{-1} = \boxed{-2e^{-x/2}}$

h) $\int_0^3 \underbrace{(3-x)}_{v}\underbrace{3^x}_{u'}\,dx$

$$\int 3^x = \frac{3^x}{\ln 3}$$

$$\frac{3^x}{\ln 3}\cdot(3-x) - \int \frac{3^x}{\ln 3}(-1)\,dx$$

$$\frac{3^x(3-x)}{\ln 3} + \frac{1}{\ln 3}\cdot\int 3^x\,dx$$

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

$$\boxed{\frac{3^x}{\ln 3}\left[(3-x)+\frac{1}{\ln 3}\right]}$$

$y = a^u$

$y' = a^u \ln a \cdot u'$

$y' = \underline{\cancel{e}a^{ux}}\cdot \ln e \cdot \underline{u'}$

$y' = \cancel{ea^{xx}} \times \ln \cancel{a}\, a\, e^x$

$(a^x)' = a^x \cdot \ln a$

$$\boxed{\int a^x = \frac{a^x}{\ln a}}$$