1) Propriedade 1: Soma das Integrais

↳ A integral de uma soma é igual à soma das integrais

Ex: $\int (3x + 5x)\,dx = \int 3x\,dx + \int 5x\,dx$

Propriedade 2: Regra da constante

↳ Quando você tem uma con~~t~~ante multiplicando a função, você pode remover ela da integral.

Ex: $\int 3x\,dx = 3\int x\,dx$

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2) $f'(x) = 3x^2 - (\cancel{0} \cdot \cancel{\cos(x^3)} + \frac{3}{4}(-\operatorname{sen}(x^3) \cdot 3x^2)) + \frac{3x^2}{x^3} + e^{-4x} \cdot -4x^{-5}$

$f'(x) = 3x^2 + \frac{9x^2}{4}\operatorname{sen}(x^3) + \frac{3x^2}{x^3} - e^{-4x} \cdot 4x^{-5x}$

3-a) $\int \left(x - \frac{1}{x}\right)^2 dx$

$\int \left(x - \frac{1}{x}\right)\left(x - \frac{1}{x}\right) dx$

$\int x^2 - 1 - 1 + \frac{1}{x^2}\,dx$

$\int x^2\,dx - \int 2\,dx + \int \frac{1}{x^2}\,dx$

$\frac{x^3}{3} - 2x - \frac{1}{x} + C$

$$3\text{-b)}\ \int\left(3\sqrt{x}+\frac{1}{\sqrt{x}}\right)dx = 3\int x^{\frac{1}{2}}\,dx+\int x^{\frac{-1}{2}}dx$$

$$2x^{\frac{3}{2}}+2\sqrt{x}+C$$

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$$3\text{-c)}\ \int\left(1+\frac{1}{x}\right)^{-3}\cdot\left(\frac{1}{x^2}\right)dx \qquad u=1+\frac{1}{x}$$

$$-\int u^{-3}du \qquad \frac{du}{dx}=-\frac{1}{x^2}$$

$$\frac{u^{-2}}{2}+C \qquad -du=\frac{1}{x^2}dx$$

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$$3\text{-d)}\ \int(\cos x-\text{sen}\,x)^2dx$$

$$\int(\cos x-\text{sen}\,x)(\cos x-\text{sen}\,x)dx$$

$$\int(\cos^2x-\text{sen}\,x\cos x-\text{sen}\,x\cos x+\text{sen}^2x)dx$$

$$\int 1-\text{sen}(2x)dx \qquad u=2x$$

$$\int 1dx-\int\text{sen}(u)du \qquad \frac{du}{dx}=2$$

$$x+\cos(2x)+C \qquad \frac{du}{2}=dx$$

3-e) $\int\left(\frac{\ln(x)}{x}-4\frac{e^{\sqrt{x}}}{\sqrt{x}}\right)dx$

$u=\ln x \qquad v=\sqrt{x}$

$du=\frac{1}{x}dx \quad 2dv=\frac{1}{\sqrt{x}}dx$

$\int\frac{\ln x}{x}dx-4\int\frac{e^{\sqrt{x}}}{\sqrt{x}}dx$

$\int u\,du-8\int e^{v}dv$

$\frac{(\ln(x))^2}{2}-8e^{\sqrt{x}}+C$

3-f) $\int\left(\sec(4x)-\frac{e^{\frac{1}{x}}+8}{x^2}\right)dx$

$u=4x \qquad v=\frac{1}{x}$

$\frac{du}{4}=dx \qquad -dv=\frac{1}{x^2}dx$

$\int\sec(4x)dx-\int\frac{e^{\frac{1}{x}}}{x^2}dx+\int\frac{8}{x^2}dx$

$\frac{1}{4}\int\sec(u)du-\int e^{v}dv+\int 8dv$

$\frac{1}{4}\ln|\sec(4x)+tg(4x)|-e^{\frac{1}{x}}+\frac{8}{x}+C$

3-g) $\int \left(\frac{\operatorname{sen}(\ln(x))}{x} - 4\cos(2x)\right)dx$

$u = 2x \quad v = \ln(x)$

$\frac{du}{2} = dx \quad dv = \frac{1}{x}dx$

$\int \frac{\operatorname{sen}(\ln(x))}{x}dx - 4\int \cos(2x)\,dx$

$\int \operatorname{sen}(v)\,dv - 2\int \cos(u)\,du$

$-\cos(\ln(x)) - 2\operatorname{sen}(2x) + C$

3-h) $\int \frac{3}{x\cdot(\ln 3x)^3} - \frac{x}{\cos^2(x^2)}dx$

$v = \ln(3x)$

$dv = \frac{1}{x}dx$

$3\int \frac{1}{x\cdot(\ln 3x)^3}dx - \int \frac{x}{\cos^2(x^2)}dx$

$3\int (\ln(3x))^{-3}\cdot\frac{1}{x}dx - \int x\cdot\sec^2(x^2)\,dx$

$u = x^2$

$\frac{du}{dx} = 2x$

$3\int v^{-3}dv \quad -\frac{1}{2}\int \sec^2(u)\,du$

$\frac{du}{2} = x\cdot dx$

$-3\frac{(\ln(3x))^{-2}}{2} - \frac{1}{2}\operatorname{tg}(x^2) + C$

3 - i) $\int e^{3x} \cdot sen(2x)\,dx$ $\quad \int u \cdot dv = u \cdot v - \int v\,du$

$dv = sen(2x)$

$v = -\frac{1}{2}\cos(2x)$

$u = e^{3x}$

$du = 3e^{3x}$

$$\int e^{3x} \cdot sen(2x)\,dx = e^{3x} \cdot \left(-\frac{1}{2}\cos(2x)\right) + \frac{3}{2}\int \cos(2x) \cdot e^{3x}\,dx$$

$$\int e^{3x} \cdot \cos(2x)\,dx = e^{3x} \cdot \left(\frac{1}{2} sen(2x)\right) - \frac{3}{2}\int sen(2x) \cdot e^{3x}\,dx$$

$$\int e^{3x} \cdot sen(2x)\,dx = e^{3x} \cdot \left(-\frac{1}{2}\cos(2x)\right) + \frac{3}{2}\left[\frac{e^{3x}}{2} sen(2x) - \frac{3}{2}\int sen(2x) \cdot e^{3x}\,dx\right]$$

$$\int e^{3x} \cdot sen(2x)\,dx = -\frac{e^{3x}}{2}\cos(2x) + \frac{3e^{3x}}{4} sen(2x) - \frac{9}{4}\int e^{3x} \cdot sen(2x)\,dx$$

$$\frac{13}{4}\int e^{3x} \cdot sen(2x)\,dx = -\frac{e^{3x}}{2}\cos(2x) + \frac{3e^{3x}}{4} sen(2x)$$

$$\int e^{3x} \cdot sen(2x)\,dx = \frac{-2e^{3x}\cos(2x) + 3e^{3x} sen(2x)}{13} + C$$

3-J) $\displaystyle\int \frac{\cos(\ln(x^2))}{x} - 4\,\text{cotg}(6x)\,dx$

$u = 6x$

$\frac{du}{6} = dx$

$\displaystyle\int \frac{\cos(\ln(x^2))}{x}\,dx - 4\int \text{cotg}(6x)\,dx$

$v = \ln(x^2)$

$\frac{dv}{dx} = \frac{2}{x}$

$\displaystyle\frac{1}{2}\int \cos(v)\,dv - \frac{4}{6}\ln|\text{sen}(6x)| + C$

$\frac{dv}{2} = \frac{1}{x}dx$

$\frac{1}{2}\cdot\text{sen}(\ln(x^2)) - \frac{4}{6}\ln|\text{sen}(6x)| + C$