Integral indefinida

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$$\int f(x)\,dx = F(x) + C$$

$f'(x) = \frac{dy}{dx} \approx \frac{\Delta y}{\Delta x} \Rightarrow$ diferencial

$dy = f'(x) \cdot dx$

$$\int x^n dx = \frac{x^{n+1}}{n+1} + C \quad \forall n \neq -1$$

1) $\int 3x^3\,dx = 3\int x^3\,dx$

$= 3 \cdot \frac{x^{3+1}}{3+1} = \frac{3x^4}{4} + C$

2) $\int \frac{x^3}{3}\,dx = \frac{1}{3}\int x^3\,dx$

$= \frac{1}{3} \cdot \frac{x^4}{4} = \frac{x^4}{12} + C$ Indef.

$\frac{3x^4}{4} + 1000 \rightarrow 3x^3$

$\frac{3x^4}{4} + \pi \rightarrow 3x^3$

$$\int (f(x) + g(x))\,dx = \int f(x)\,dx + \int g(x)\,dx = F(x) + G(x) + C$$

3) $\int \left(4x^4 + \frac{x^2}{2}\right) dx =$

$= \int 4x^4\,dx + \int \frac{x^2}{2}\,dx =$

$= 4\int x^4\,dx + \frac{1}{2}\int x^2\,dx =$

$= 4 \cdot \frac{x^5}{5} + \frac{1}{2}\frac{x^3}{3} = \frac{4x^5}{5} + \frac{x^3}{6} + C$

4) $\int (9x^3 - 2x^5)\,dx = \frac{9x^4}{4} - \frac{2x^6}{3} + C$

5) $\int \left[\frac{3x^2}{4} - \frac{2}{x^3}\right] dx = \int \frac{3x^2}{4}\,dx - \int \frac{2}{x^3}\,dx =$

$= \frac{3}{4}\int x^2\,dx - 2\int x^{-3}\,dx = \frac{3}{4} \cdot \frac{x^3}{3} - 2 \cdot \frac{x^{-3+1}}{-3+1}$ ← -2

$= \frac{x^3}{4} + x^{-2} = \frac{x^3}{4} + \frac{1}{x^2} + C$

a^x

$= \frac{x^2}{4} + x = \frac{x}{4} + \frac{x}{x^2} + C$

6) $\int \left[\frac{2x^3}{3} + 3^x\right] dx = \int \frac{2x^3}{3} dx + \int 3^x dx =$

$= \frac{2}{3}\int x^3 dx + \int 3^x dx$

$= \frac{2}{3} \cdot \frac{x^4}{4_2} + \frac{3^x}{\ln(3)} = \frac{x^4}{6} + \frac{3^x}{\ln(3)} + C$

7) $\int 4^x - e^x dx = \frac{4^x}{\ln(4)} - e^x + C$

8) $\int \left(\frac{x^3}{3} + \sqrt{x}\right) dx = \int \frac{x^3}{3} dx + \int x^{1/2} dx$

$= \frac{1}{3}\int x^3 dx + \int x^{1/2} dx$

$= \frac{1}{3} \cdot \frac{x^4}{4} + \frac{x^{3/2}}{3/2} = \frac{x^4}{12} + \frac{2\sqrt{x^3}}{3} + C$

$x^{m/n} = \sqrt[n]{x^m}$

$x^{3/2} = \sqrt{x^3}$

$\int f[u(x)]\,dx$

f. composta. trocar dx por du

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

$\int u^n du = \frac{u^{n+1}}{n+1} + C$

$\int u^n dx \not\exists$

$\int (2x+1)^4 dx$

$f(x) = (2x+1)^4$ (u)

$f(u) = u^4$

$u(x) = 2x+1$

$u'(x) = 2$

$\frac{du}{dx} = u'(x)$

↳ derivar u em relação à variável x é ...

$\int u^4 du$

$u'(x) = 2$ → Ex: derivar u em relação à variável x e ...!

$$\int u^4 \, dx = \int u^4 \frac{du}{2}$$

$$= \int u^4 \cdot \frac{1}{2} \cdot du$$

$$= \frac{1}{2} \int u^4 \, du = \frac{1}{2} \cdot \frac{u^5}{5}$$

$$= \frac{u^5}{10} = \frac{(2x+1)^5}{10} + C$$

$du = u'(x) \cdot dx$

$\Rightarrow dx = \dfrac{du}{u'(x)}$