جدول کامل فرمول های انتگرال

Rules for integration of general functions

$$\int af(x)\,dx = a\int f(x)\,dx \qquad (a \neq 0,\ \text{constant})$$

$$\int [f(x) + g(x)]\,dx = \int f(x)\,dx + \int g(x)\,dx$$

$$\int f'(x)g(x)\,dx = f(x)g(x) - \int f(x)g'(x)\,dx$$

$$\int f'(x)f(x)\,dx = \frac{1}{2}[f(x)]^2 + C$$

$$\int \frac{f'(x)}{f(x)}\,dx = \ln|f(x)| + C$$

$$\int [f(x)]^n f'(x)\,dx = \frac{[f(x)]^{n+1}}{n+1} + C \qquad (\text{for } n \neq -1)$$

Rational functions

$$\int \mathrm{d}x = x + C$$

$$\int x^n\,\mathrm{d}x = \frac{x^{n+1}}{n+1} + C \qquad \text{if } n \neq -1$$

$$\int \frac{dx}{x} = \ln|x| + C$$

$$\int \frac{dx}{a^2 + x^2} = \frac{1}{a}\arctan\frac{x}{a} + C$$

Irrational functions

$$\int \frac{dx}{\sqrt{a^2 - x^2}} = \sin^{-1}\frac{x}{a} + C$$

$$\int \frac{-dx}{\sqrt{a^2 - x^2}} = \cos^{-1}\frac{x}{a} + C$$

$$\int \frac{dx}{x\sqrt{x^2 - a^2}} = \frac{1}{a}\sec^{-1}\frac{|x|}{a} + C$$

Logarithms

$$\int \ln x \, dx = x \ln x - x + C$$

$$\int \log_b x \, dx = x \log_b x - x \log_b e + C$$

Exponential functions

$$\int e^x \, dx = e^x + C$$
$$\int a^x \, dx = \frac{a^x}{\ln a} + C$$

Trigonometric functions

$$\int \sin x \, dx = -\cos x + C$$

$$\int \cos x \, dx = \sin x + C$$

$$\int \tan x \, dx = -\ln|\cos x| + C$$

$$\int \cot x \, dx = \ln|\sin x| + C$$

$$\int \sec x \, dx = \ln|\sec x + \tan x| + C$$

$$\int \csc x \ \cot x \, dx = -\csc x + C$$

$$\int \sec^2 x \, dx = \tan x + C$$

$$\int \csc^2 x \, dx = -\cot x + C$$

$$\int \sec x \ \tan x \, dx = \sec x + C$$

$$\int \csc x \, dx = \ln|\csc x - \cot x| + C$$

$$\int \sin^2 x \, dx = \frac{1}{2}(x - \sin x \cos x) + C$$

$$\int \cos^2 x \, dx = \frac{1}{2}(x + \sin x \cos x) + C$$

$$\int \sec^3 x \, dx = \frac{1}{2}\sec x \tan x + \frac{1}{2}\ln|\sec x + \tan x| + C$$

$$\int \sin^n x \, dx = -\frac{\sin^{n-1} x \cos x}{n} + \frac{n-1}{n}\int \sin^{n-2} x \, dx$$

$$\int \cos^n x \, dx = \frac{\cos^{n-1} x \sin x}{n} + \frac{n-1}{n}\int \cos^{n-2} x \, dx$$

$$\int \arctan x \, dx = x \ \arctan x - \frac{1}{2}\ln\left|1 + x^2\right| + C$$

Hyperbolic functions

$$\int \sinh x \, dx = \cosh x + C$$

$$\int \cosh x \, dx = \sinh x + C$$

$$\int \tanh x \, dx = \ln|\cosh x| + C$$

$$\int \coth x\,dx = \ln|\sinh x| + C$$

$$\int \operatorname{sech} x\,dx = \arctan(\sinh x) + C$$

$$\int \operatorname{csch} x\,dx = \ln\left|\tanh\frac{x}{2}\right| + C$$

$$\int \operatorname{sech}^2 x\,dx = \tanh x + C$$

Inverse hyperbolic functions

$$\int \mathrm{arcsinh}x\,dx = x\mathrm{arcsinh}x - \sqrt{x^2+1} + C$$

$$\int \mathrm{arccosh}x\,dx = x\mathrm{arccosh}x - \sqrt{x^2-1} + C$$

$$\int \mathrm{arctanh}x\,dx = x\mathrm{arctanh}x + \frac{1}{2}\log\left(1-x^2\right) + C$$

$$\int \mathrm{arccoth}\,x\,dx = x\mathrm{arccoth}x + \frac{1}{2}\log\left(x^2-1\right) + C$$

$$\int \mathrm{arccsch}\,x\,dx = x\mathrm{arccsch}x + \log\left[x\left(\sqrt{1+\frac{1}{x^2}}+1\right)\right] + C$$

$$\int \mathrm{arcsech}\,x\,dx = x\mathrm{arcsech}x - \arctan\left(\frac{x}{x-1}\sqrt{\frac{1-x}{1+x}}\right) + C$$

Definite integrals lacking closed-form ant derivatives

$$\int_0^\infty \sqrt{x}\,e^{-x}\,dx = \frac{1}{2}\sqrt{\pi}$$

$$\int_0^\infty e^{-x^2}\,dx = \frac{1}{2}\sqrt{\pi}$$

$$\int_0^\infty \frac{\sin(x)}{x}\,dx = \frac{\pi}{2}$$

$$\int_0^\infty \frac{x}{e^x - 1}\,dx = \frac{\pi^2}{6}$$

$$\int_0^\infty \frac{x^3}{e^x - 1}\,dx = \frac{\pi^4}{15}$$

$$\int_0^{2\pi} e^{x\cos\theta} d\theta = 2\pi I_0(x)$$

$$\int_0^\infty \frac{\sin^2 x}{x^2}\,dx = \frac{\pi}{2}$$

$$\int_{-\infty}^\infty (1 + x^2/\nu)^{-(\nu+1)/2} dx = \frac{\sqrt{\nu\pi}\ \Gamma(\nu/2)}{\Gamma((\nu+1)/2))}$$

$$\int_0^{2\pi} e^{x\cos\theta + y\sin\theta} d\theta = 2\pi I_0\left(\sqrt{x^2+y^2}\right)$$

$$\int_0^{\frac{\pi}{2}} \sin^n x\,dx = \int_0^{\frac{\pi}{2}} \cos^n x\,dx = \frac{1\cdot 3\cdot 5\cdot \cdots \cdot (n-1)}{2\cdot 4\cdot 6\cdot \cdots \cdot n}\frac{\pi}{2}$$

$$\int_0^\infty x^{z-1}\,e^{-x}\,dx = \Gamma(z)$$

$$\int_0^{\frac{\pi}{2}} \sin^n x\,dx = \int_0^{\frac{\pi}{2}} \cos^n x\,dx = \frac{2\cdot 4\cdot 6\cdot \cdots \cdot (n-1)}{3\cdot 5\cdot 7\cdot \cdots \cdot n}$$

$$\int_{-\infty}^\infty e^{-(ax^2+bx+c)}\,dx = \sqrt{\frac{\pi}{a}}\exp\left[\frac{b^2-4ac}{4a}\right]$$

$$\int_a^b f(x)\,dx = (b-a)\sum_{n=1}^\infty \sum_{m=1}^{2^n-1} (-1)^{m+1} 2^{-n} f(a + m\,(b-a)\,2^{-n})$$

$$\int_0^1 x^{-x}\,dx = \sum_{n=1}^\infty n^{-n} \qquad (= 1.291285997\ldots)$$

$$\int_0^1 x^x\,dx = \sum_{n=1}^\infty -(-1)^n n^{-n} \quad (= 0.783430510712\ldots)$$