

## جدول کامل فرمول های انتگرال

### Rules for integration of general functions

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

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

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

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

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

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

### Rational functions

$$\int dx = x + C$$

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

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

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

### **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**

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

### 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

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

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

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

$$\int \operatorname{arcoth} x \, dx = x \operatorname{arcoth} x + \frac{1}{2} \log(x^2 - 1) + C$$

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

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

### Definite integrals lacking closed-form ant derivatives

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

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

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

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

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

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

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

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

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

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

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

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

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

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

$$\int_0^1 x^{-x} dx = \sum_{n=1}^{\infty} n^{-n} \quad (= 1.291285997\dots)$$

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

این کتاب از وبلاگ میهن کتاب دانلود شده است.  
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