Calculus Integral Formulas

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Basic Integrals

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

$$\int \frac{1}{x}\,dx = \ln|x| + C$$

$$\int e^{ax}\,dx = \frac{1}{a}e^{ax} + C$$

$$\int b^{ax}\,dx = \frac{1}{a \ln b}\,b^{ax} + C;\ b > 0, b \neq 1$$

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

$$\int \log_b x\,dx = \frac{1}{\ln b}(x \ln x - x) + C$$

Trigonometric Integrals

$$\int \sin\theta\,d\theta = -\cos\theta + C$$

$$\int \cos\theta\,d\theta = \sin\theta + C$$

$$\int \tan\theta\,d\theta = \ln|\sec\theta| + C$$

$$\int \csc\theta\,d\theta = -\ln|\csc\theta + \cot\theta| + C$$

$$\int \sec\theta\,d\theta = \ln|\sec\theta + \tan\theta| + C$$

$$\int \cot\theta\,d\theta = \ln|\sin\theta| + C$$

Substitution Rule

$$\int f(g(x))g'(x)$$

$$= \int f(u)\,du,\ u = g(x)$$

Integration by Parts

$$\int u\,dv = uv - \int v\,du$$

Fundamental Theorem of Calculus

$$\int_a^b f(x)\,dx = F(b) - F(a)$$

Inverse Trigonometric Integrals

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

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

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

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

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

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

$$\int \sec^{-1}x\,dx = x\sec^{-1}x - \ln(x + \sqrt{x^2 - 1}) + C$$

Trigonometric Integrals

$$\int \sin^2\theta\,d\theta = \frac{\theta}{x} - \frac{\sin(2\theta)}{4} + C$$

$$\int \cos^2\theta\,d\theta = \frac{\theta}{2} + \frac{\sin(2\theta)}{4} + C$$

$$\int \csc^2(a\theta)\,d\theta = -\frac{1}{a}\cot(a\theta) + C$$

$$\int \sec^2(a\theta)\,d\theta = \frac{1}{a}\tan(a\theta) + C$$

$$\int \tan^2\theta\,d\theta = \tan\theta - \theta + C$$

$$\int \cot^2\theta\,d\theta = -\cot\theta - \theta + C$$

Trig Power-Reducing Formulas

$$\sin^2\theta = \frac{1 - \cos 2\theta}{2}$$

$$\cos^2\theta = \frac{1 + \cos 2\theta}{2}$$

$$\tan^2\theta = \frac{1 - \cos 2\theta}{1 + 2\cos\theta}$$

Pythagorean Identities

$$\sin^2\theta + \cos^2\theta = 1$$

$$\tan^2\theta + 1 = \sec^2\theta$$

$$\cot^2\theta + 1 = \csc^2\theta$$

$$\int \sin^3\theta\,d\theta = \frac{1}{3}\cos^3\theta - \cos\theta + C$$

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

$$\int \csc^3\theta\,d\theta = \frac{1}{2}\csc\theta\cot\theta - \frac{1}{2}\ln|\csc\theta + \cot\theta| + C$$

$$\int \cos^3\theta\,d\theta = -\frac{1}{3}\sin^3\theta + \sin\theta + C$$

$$\int \tan^3\theta\,d\theta = \frac{1}{2}\tan^2\theta - \ln|\sec\theta| + C$$

$$\int \cot^3\theta\,d\theta = -\frac{1}{2}\cot^2\theta - \ln|\sin\theta| + C$$