

Useful Integrals

All integrals are defined up to a real constant c .

$$\int dx = x$$

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

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

$$\int e^x dx = e^x$$

$$\int \cos x dx = \sin x$$

$$\int \sin x dx = -\cos x$$

$$\int e^{nx} dx = \frac{e^{nx}}{n} \quad n \neq 0$$

$$\int a^x dx = \frac{a^x}{\ln a} \quad a \neq 1$$

$$\int \ln x dx = x \ln x - x$$

$$\int x^n \ln x dx = \frac{x^{n+1}}{n+1} \left(\ln x - \frac{1}{n+1} \right) \quad n \neq -1$$

$$\int \frac{\ln x}{x} dx = \frac{1}{2} \ln^2 x$$

$$\int \frac{\ln x}{x^2} dx = -\frac{\ln x}{x} - \frac{1}{x}$$

$$\int \frac{1}{x \ln x} dx = \ln(\ln x) \quad x > 1$$

$$\int x e^{-x} dx = -e^{-x}(x + 1)$$

$$\int \frac{x}{1+x} dx = x - \ln(1+x)$$

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

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

$$\int \cos(nx) dx = \frac{\sin(nx)}{n} \quad n \neq 0$$

$$\int \sin(nx) dx = -\frac{\cos(nx)}{n} \quad n \neq 0$$

$$\int x e^{ax} dx = \frac{e^{ax}}{a} \left(x - \frac{1}{a} \right) \quad a \in \mathbb{R}$$

$$\int x^2 e^{ax} dx = \frac{e^{ax}}{a} \left(x^2 - \frac{2x}{a} + \frac{2}{a^2} \right) \quad a \in \mathbb{R}$$

$$\int \frac{1}{\cos^2 x} dx = \frac{\sin x}{\cos x} = \tan x$$

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

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

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

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

$$\int \frac{1}{a^2+x^2} dx = \frac{1}{a} \tan^{-1} \frac{x}{a} \quad a \in \mathbb{R}$$

$$\int \sqrt[n]{x} dx = \frac{n}{n+1} \sqrt[n]{x^{n+1}}$$

$$\int \frac{1}{x^2-a^2} dx = \frac{1}{2a} \ln \left| \frac{x-a}{x+a} \right| \quad a \in \mathbb{R}$$

$$\int \frac{1}{\sqrt{x^2+a^2}} = \ln \left| x + \sqrt{a^2+x^2} \right| \quad a \in \mathbb{R}$$

$$\int \frac{1}{\sqrt{x^2 - a^2}} = \ln \left| x + \sqrt{a^2 - x^2} \right| \quad a \in \mathbb{R}$$

$$\int \frac{1}{\sqrt{ax + b}} dx = \frac{2\sqrt{ax + b}}{a} \quad a, b \in \mathbb{R}$$

$$\int \frac{x}{\sqrt{ax + b}} dx = \frac{2(ax - 2b)\sqrt{ax + b}}{3a^2} \quad a, b \in \mathbb{R}$$

$$\int \sqrt{ax + b} dx = \frac{2\sqrt{(ax + b)^3}}{3a} \quad a, b \in \mathbb{R}$$

$$\int x \sin(ax) dx = \frac{\sin(ax)}{a^2} - \frac{x \cos(ax)}{a} \quad a \in \mathbb{R}$$

$$\int x \cos(ax) dx = \frac{\cos(ax)}{a^2} + \frac{x \sin(ax)}{a} \quad a \in \mathbb{R}$$

$$\int f^n(x) f'(x) dx = \frac{f^{n+1}(x)}{n+1}$$

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

$$\int \frac{f'(x)}{\sqrt{f(x)}} dx = 2\sqrt{f(x)}$$