Symbolab Integrals Cheat Sheet

Common Integrals:

- $\int x^{-1}dx = \ln(x)$
- $\int \frac{dx}{x} = \ln(x)$
- $\int |x|dx = \frac{x\sqrt{x^2}}{2}$
- $\int e^x dx = e^x$
- $\int \sin(x)\, dx = -\cos(x)$
- $\int \cos(x)\, dx = \sin(x)$

Trigonometric Integrals:

- $\int \sec^2(x)\, dx = \tan(x)$
- $\int \csc^2(x)\, dx = -\cot(x)$
- $\int \frac{dx}{\sin^2(x)} = -\cot(x)$
- $\int \frac{dx}{\cos^2(x)} \tan(x)$

Arc Trigonometric Integrals:

- $\int \frac{dx}{x^2+1} = \arctan(x)$
- $\int \frac{dx}{\sqrt{1-x^2}} = \arcsin(x)$
- $\int \frac{-1}{\sqrt{1-x^2}} dx = \arccos(x)$
- $\int \frac{-1}{x^2+1} dx = \mathrm{arccot}(x)$
- $\int \frac{-1}{|x|\sqrt{x^2-1}} dx = \mathrm{arccsc}(x)$
- $\int \frac{dx}{|x|\sqrt{x^2-1}} = \mathrm{arcsec}(x)$
- $\int \frac{dx}{1-x^2} = \mathrm{arctanh}(x)$
- $\int \frac{dx}{\sqrt{x^2+1}} = \mathrm{arcsinh}(x)$
- $\int \frac{dx}{|x|\sqrt{x^2+1}} = -\mathrm{arccsch}(x)$

Hyperbolic Integrals:

- $\int \mathrm{sech}^2(x)\, dx = \tanh(x)$
- $\int \mathrm{csch}^2(x)\, dx = -\coth(x)$
- $\int \cosh(x)\, dx = \sinh(x)$
- $\int \sinh(x)\, dx = \cosh(x)$
- $\int \mathrm{csch}(x)\, dx = \ln\left(\tanh\left(\frac{x}{2}\right)\right)$
- $\int \sec(x)\, dx = \ln(\tan(x) + \sec(x))$

Integrals of Special Functions:

- $\int \cos\left(\frac{x^2\pi}{2}\right) dx = C(x)$
- $\int \frac{\sin(x)}{x} dx = \mathrm{Si}(x)$
- $\int \frac{\cos(x)}{x} dx = \mathrm{Ci}(x)$
- $\int \frac{\sinh(x)}{x} dx = \mathrm{Shi}(x)$
- $\int \frac{\cosh(x)}{x} dx = \mathrm{Chi}(x)$
- $\int \frac{e^x}{x} dx = \mathrm{Ei}(x)$
- $\int e^{-x^2} dx = \frac{\sqrt{\pi}}{2} \mathrm{erf}(x)$
- $\int e^{x^2} dx = e^{x^2} \mathrm{F}(x)$
- $\int \sin\left(\frac{x^2\pi}{2}\right) dx = \mathrm{S}(x)$
- $\int \sin(x^2)\, dx = \sqrt{\frac{\pi}{2}}\mathrm{S}\left(\sqrt{\frac{2}{\pi}}x\right)$
- $\int \frac{dx}{\ln(x)} = \mathrm{li}(x)$

Indefinite Integrals Rules:

- Integration By Parts: $\int uv' = uv - \int u'v$
- Integral of a Constant: $\int f(a)dx = x \cdot f(a)$
- Taking a Constant out: $\int a \cdot f(x)dx = a \cdot \int f(x)dx$
- Sum/Difference Rule: $\int f(x) \pm g(x)dx = \int f(x)dx \pm \int g(x)dx$
- Add a Constant to the Solution: If $\frac{dF(x)}{dx} = f(x)$, then $\int f(x)dx = F(x) + C$
- Power Rule: $\int x^a dx = \frac{x^{a+1}}{a+1}, \quad a \neq -1$
- Integral Substitution: $\int f\big(g(x)\big) \cdot g'(x)dx = \int f(u)du\,, \quad u = g(x)$

Definite Integrals Rules:

- Definite Integral Boundaries: $\int_a^b f(x)dx = F(b) - F(a) = \lim_{x \to b^-} F(x) - \lim_{x \to a^+} F(x)$
- Odd Function: If $f(x) = -f(-x)$, then $\int_{-a}^{a} f(x)dx = 0$
- Undefined Points: If $a < b < c$, and $f(b)$ is undefined, then $\int_a^c f(x)dx = \int_a^b f(x)dx + \int_b^c f(x)dx$
- Definite Integral of a defined point: $\int_a^a f(x)dx = 0$