Common Integrals

Basic Integrals

$$\int x^n dx = \frac{x^{n+1}}{n+1} + c \quad (n \neq -1) \qquad \int x^{-1} dx = \int \frac{1}{x} dx = \ln|x| + c$$

Exponential and Logarithmic Integrals

$$\int e^x dx = e^x + c \qquad \int a^x dx = \frac{a^x}{\ln a} + c \qquad \int \ln x dx = x \ln x - x + c$$

Trigonometric Integrals

$$\int \sin x dx = -\cos x + c \qquad \int \cos x dx = \sin x + c \qquad \int \tan x dx = \ln|\sec x| + c$$

$$\int \csc x dx = -\ln|\csc x + \cot x| + c \qquad \int \sec x dx = \ln|\sec x + \tan x| + c \qquad \int \cot x dx = \ln|\sin x| + c$$

$$\int \csc^2 x dx = -\cot x + c \qquad \int \sec^2 x dx = \tan x + c$$

$$\int \csc x \cot x dx = -\csc x + c \qquad \int \sec x \tan x dx = \sec x + c$$

Hyperbolic Integrals

$$\int \sinh x dx = \cosh x + c \qquad \int \cosh x dx = \sinh x + c \qquad \int \tanh x dx = \ln(\cosh x) + c$$

$$\int \operatorname{csch} x dx = \ln\left|\tanh \frac{x}{2}\right| + c \qquad \int \operatorname{sech} x dx = \tan^{-1}|\sinh x| + c \qquad \int \coth x dx = \ln|\sinh x| + c$$

$$\int \operatorname{csch}^2 x dx = -\coth x + c \qquad \int \operatorname{sech}^2 x dx = \tanh x + c$$

$$\int \operatorname{csch} x \coth x dx = -\operatorname{csch} x + c \qquad \int \operatorname{sech} x \tanh x dx = -\operatorname{sech} x + c$$

Inverse Trigonometric Integrals

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

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

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

Substitution, Integration by Parts, and a Useful Property

$$\int_a^b f(g(x))g'(x)dx = \int_{g(a)}^{g(b)} f(u)du \quad \text{where } u = g(x)$$

$\int u dv = uv - \int v du$ Note: Select u and dv in such a way that you can differentiate u and integrate dv to find the other quantities.

If $f(x)$ is an ***odd*** function, then $\int_{-a}^{a} f(x)dx = 0$.

Note: Check by differentiating.