Integration Techniques Summary

Integrate	Basic	General
$x^n / [\mathrm{f}(x)]^n$ (where $n \neq -1$)	$\int x^n dx = \frac{x^{n+1}}{n+1} + c$	$\int \mathrm{f}'(x)[\mathrm{f}(x)]^n dx = \frac{[\mathrm{f}(x)]^{n+1}}{n+1} + c$
$x^{-1} / \frac{\mathrm{f}'(x)}{\mathrm{f}(x)}$	$\int \frac{1}{x} dx = \ln\lvert x\rvert + c$	$\int \frac{\mathrm{f}'(x)}{\mathrm{f}(x)} dx = \ln\lvert \mathrm{f}(x)\rvert + c$
$e^x / e^{\mathrm{f}(x)}$	$\int e^x dx = e^x + c$	$\int \mathrm{f}'(x) e^{\mathrm{f}(x)} dx = e^{\mathrm{f}(x)} + c$
Trigonometric Functions	$\int \sin x\, dx = -\cos x + c$ $\int \cos x\, dx = \sin x + c$ $\int \sec^2 x\, dx = \tan x + c$ $\int \mathrm{cosec}^2 x\, dx = -\cot x + c$ $\int \sec x \tan x\, dx = \sec x + c$ $\int \mathrm{cosec}\, x \cot x\, dx = -\mathrm{cosec}\, x + c$	$\int \mathrm{f}'(x) \sin[\mathrm{f}(x)]\, dx = -\cos[\mathrm{f}(x)] + c$ $\int \mathrm{f}'(x) \cos[\mathrm{f}(x)]\, dx = \sin[\mathrm{f}(x)] + c$ $\int \mathrm{f}'(x) \sec^2[\mathrm{f}(x)]\, dx = \tan[\mathrm{f}(x)] + c$ $\int \mathrm{f}'(x) \mathrm{cosec}^2[\mathrm{f}(x)]\, dx = -\cot[\mathrm{f}(x)] + c$ $\int \mathrm{f}'(x) \sec[\mathrm{f}(x)] \tan[\mathrm{f}(x)]\, dx = \sec[\mathrm{f}(x)] + c$ $\int \mathrm{f}'(x) \mathrm{cosec}[\mathrm{f}(x)] \cot[\mathrm{f}(x)]\, dx = -\mathrm{cosec}[\mathrm{f}(x)] + c$
Other Trigonometric Functions	✶ $\int \tan x\, dx = \ln\lvert\sec x\rvert + c$ ✶ $\int \cot x\, dx = \ln\lvert\sin x\rvert + c$ ✶ $\int \mathrm{cosec}\, x\, dx = -\ln\lvert\mathrm{cosec}\, x + \cot x\rvert + c$ ✶ $\int \sec x\, dx = \ln\lvert\sec x + \tan x\rvert + c$	$\int \mathrm{f}'(x) \tan[\mathrm{f}(x)]\, dx = \ln\lvert\sec[\mathrm{f}(x)]\rvert + c$ $\int \mathrm{f}'(x) \cot[\mathrm{f}(x)]\, dx = \ln\lvert\sin[\mathrm{f}(x)]\rvert + c$ $\int \mathrm{f}'(x) \mathrm{cosec}[\mathrm{f}(x)]\, dx = -\ln\lvert\mathrm{cosec}[\mathrm{f}(x)] + \cot[\mathrm{f}(x)]\rvert + c$ $\int \mathrm{f}'(x) \sec[\mathrm{f}(x)]\, dx = \ln\lvert\sec[\mathrm{f}(x)] + \tan[\mathrm{f}(x)]\rvert + c$
Others	☆ $\int \frac{1}{x^2 + a^2} dx = \frac{1}{a} \tan^{-1}\left(\frac{x}{a}\right) + c$ ☆ $\int \frac{1}{\sqrt{a^2 - x^2}} dx = \sin^{-1}\left(\frac{x}{a}\right) + c$ ✶ $\int \frac{1}{x^2 - a^2} dx = \frac{1}{2a} \ln\left\lvert\frac{x-a}{x+a}\right\rvert + c$ ✶ $\int \frac{1}{a^2 - x^2} dx = \frac{1}{2a} \ln\left\lvert\frac{a+x}{a-x}\right\rvert + c$	$\int \frac{\mathrm{f}'(x)}{[\mathrm{f}(x)]^2 + a^2} dx = \frac{1}{a} \tan^{-1}\left(\frac{\mathrm{f}(x)}{a}\right) + c$ $\int \frac{\mathrm{f}'(x)}{\sqrt{a^2 - [\mathrm{f}(x)]^2}} dx = sin^{-1}\left(\frac{\mathrm{f}(x)}{a}\right) + c$ $\int \frac{\mathrm{f}'(x)}{[\mathrm{f}(x)]^2 - a^2} dx = \frac{1}{2a} \ln\left\lvert\frac{\mathrm{f}(x)-a}{\mathrm{f}(x)+a}\right\rvert + c$ $\int \frac{\mathrm{f}'(x)}{a^2 - [\mathrm{f}(x)]^2} dx = \frac{1}{2a} \ln\left\lvert\frac{a+\mathrm{f}(x)}{a-\mathrm{f}(x)}\right\rvert + c$

☆ Can be found in MF27

✶ Presented differently in MF27

By Parts	$\int u \frac{dv}{dx} dx = uv - \int v \frac{du}{dx} dx$	Guide on Choice of u: **LIATE** (Logarithmic, Inverse trigonometry, Algebraic, Trigonometry, Exponential)