4. Integration Formulae

$$\int I \cdot II \cdot dx = I \cdot \int II\ dx - \int \left[\int II\, dx\right] \cdot \frac{dI}{dx} \cdot dx; \qquad \int e^x [f(x) + f'(x)]\, dx = e^x f(x)$$

1. $\int x^n dx = \frac{x^{n+1}}{n+1}$ if $n \neq -1$
2. $\int \frac{dx}{x} = \log x$
3. $\int \sin x\, dx = -\cos x$
4. $\int \cos x\, dx = \sin x$
5. $\int \sec^2 x\, dx = \tan x$
6. $\int \operatorname{cosec}^2 x\, dx = -\cot x$
7. $\int \sec x \tan x\, dx = \sec x$
8. $\int \operatorname{cosec} x \cot x\, dx = -\operatorname{cosec} x$
9. $\int \tan x\, dx = \log \sec x$
10. $\int \cot x\, dx = -\log \operatorname{cosec} x = \log \sin x$
11. $\int \sec x\, dx = \log\left\{\tan\left(\frac{x}{2} + \frac{\pi}{4}\right)\right\} = \log(\sec x + \tan x)$
12. $\int \operatorname{cosec} x\, dx = \log\left(\tan\frac{x}{2}\right) = \log(\operatorname{cosec} x - \cot x)$
13. $\int e^x dx = e^x$
14. $\int a^x dx = \frac{a^x}{\log a}$
15. $\int \frac{dx}{\sqrt{a^2 - x^2}} = \sin^{-1}\frac{x}{a}$
16. $\int \frac{dx}{\sqrt{x^2 - a^2}} = \log\left(x + \sqrt{x^2 - a^2}\right)$
17. $\int \frac{dx}{\sqrt{x^2 + a^2}} = \log\left(x + \sqrt{x^2 + a^2}\right)$
18. $\int \frac{dx}{x^2 + a^2} = \frac{1}{a}\tan^{-1}\left(\frac{x}{a}\right)$
19. $\int \frac{dx}{x^2 - a^2} = \frac{1}{2a}\log\left(\frac{x-a}{x+a}\right)$
20. $\int \frac{dx}{a^2 - x^2} = \frac{1}{2a}\log\left(\frac{a+x}{a-x}\right)$
21. $\int \frac{dx}{x\sqrt{x^2 - 1}} = \sec^{-1} x$
22. $\int e^{ax} \sin bx\, dx = \frac{1}{a^2 + b^2} \cdot e^{ax}(a \sin bx - b \cos bx)$
23. $\int e^{ax} \cos bx\, dx = \frac{1}{a^2 + b^2} \cdot e^{ax}(a \cos bx + b \sin bx)$
24. $\int \sqrt{a^2 - x^2}\, dx = \frac{x}{2}\sqrt{a^2 - x^2} + \frac{a^2}{2}\sin^{-1}\left(\frac{x}{a}\right)$
25. $\int \sqrt{x^2 + a^2}\, dx = \frac{x}{2}\sqrt{x^2 + a^2} + \frac{a^2}{2}\log\left(x + \sqrt{x^2 + a^2}\right)$
26. $\int \sqrt{x^2 - a^2}\, dx = \frac{x}{2}\sqrt{x^2 - a^2} - \frac{a^2}{2}\log\left(x + \sqrt{x^2 - a^2}\right)$
27. $\int \sin h\, x\, dx = \cos h\, x$
28. $\int \cos h\, x\, dx = \sin h\, x$
29. $\int \tan h\, x\, dx = \log(\cos h\, x)$
30. $\int \sec h\, x\, dx = \sin^{-1}(\tan h\, x)$
31. $\int \operatorname{cosec} h\, x\, dx = \tan\left|\tan h \frac{x}{2}\right|$
32. $\int \cot h\, x\, dx = \log|\sin h\, x|$

Definite Integrals

1. $\int_0^a f(x)\, dx = \int_0^a f(a - x)\, dx$
2. $\int_a^b f(x)\, dx = \int_a^b f(a + b - x)\, dx$