

# Math Formulas: Integrals of Logarithmic Functions

## List of integrals involving logarithmic functions

1. 
$$\int \ln(cx)dx = x \ln(cx) - x$$
2. 
$$\int \ln(ax + b)dx = x \ln(ax + b) - x + \frac{b}{a} \ln(ax + b)$$
3. 
$$\int (\ln x)^2 dx = x(\ln x)^2 - 2x \ln x + 2x$$
4. 
$$\int (\ln(cx))^n dx = x(\ln x)^n - n \cdot \int (\ln(cx))^{n-1} dx$$
5. 
$$\int \frac{dx}{\ln x} = \ln |\ln x| + \ln x + \sum_{n=2}^{\infty} \frac{(\ln x)^n}{n \cdot n!}$$
6. 
$$\int \frac{dx}{(\ln x)^n} = -\frac{x}{(n-1)(\ln x)^{n-1}} + \frac{1}{n-1} \int \frac{dx}{(\ln x)^{n-1}}$$
7. 
$$\int x^m \cdot \ln x dx = x^{m+1} \left( \frac{\ln x}{m+1} - \frac{1}{(m+1)^2} \right) \quad (\text{for } m \neq -1)$$
8. 
$$\int x^m \cdot (\ln x)^n dx = \frac{x^{m+1}(\ln x)^n}{m+1} - \frac{n}{m+1} \int x^m (\ln x)^{n-1} dx \quad (\text{for } m \neq -1)$$
9. 
$$\int \frac{(\ln x)^n}{x} dx = \frac{(\ln x)^{n+1}}{n+1}, \quad (\text{for } n \neq -1)$$
10. 
$$\int \frac{\ln x^n}{x} dx = \frac{(\ln x^n)^2}{2n}, \quad (\text{for } n \neq 0)$$
11. 
$$\int \frac{\ln x}{x^m} dx = -\frac{\ln x}{(m-1)x^{m-1}} - \frac{1}{(m-1)^2 x^{m-1}}, \quad (\text{for } m \neq 1)$$
12. 
$$\int \frac{(\ln x)^n}{x^m} dx = -\frac{(\ln x)^n}{(m-1)x^{m-1}} + \frac{n}{m-1} \int \frac{(\ln x)^{n-1}}{x^m} dx, \quad (\text{for } m \neq 1)$$
13. 
$$\int \frac{dx}{x \cdot \ln x} = \ln |\ln x|$$
14. 
$$\int \frac{dx}{x^n \cdot \ln x} = \ln |\ln x| + \sum_{i=1}^{\infty} (-1)^i \frac{(n-1)^i (\ln x)^i}{i \cdot i!}$$
15. 
$$\int \frac{dx}{x(\ln x)^n} = -\frac{1}{(n-1)(\ln x)^{n-1}}, \quad (\text{for } n \neq 1)$$
16. 
$$\int \ln(x^2 + a^2) dx = x \ln(x^2 + a^2) - 2x + 2a \arctan \frac{x}{a}$$
17. 
$$\int \sin(\ln x) dx = \frac{x}{2} (\sin(\ln x) - \cos(\ln x))$$
18. 
$$\int \cos(\ln x) dx = \frac{x}{2} (\sin(\ln x) + \cos(\ln x))$$