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. \( \int \frac{dx}{\ln x} = \ln |\ln x| + \ln x + \sum_{n=2}^{\infty} \frac{(\ln x)^i}{i \cdot i!} \)
6. \( \int \frac{x}{(\ln x)^n} \, dx = -\frac{x}{(n-1)(\ln x)^{n-1}} + \frac{1}{n-1} \int \frac{dx}{(\ln x)^{n-1}} \)
7. \( \int x^m \cdot \ln x \, dx = x^{m+1} \left( \frac{\ln x}{m+1} - \frac{1}{(m+1)^2} \right) \) (for \( m \neq 1 \))
8. \( \int x^m \cdot (\ln x)^n \, dx = x^{m+1}(\ln x)^n \left( \frac{m+1}{m+1} - \frac{n}{(m+1)^2} \right) \int x^m (\ln x)^{n-1} \, dx \) (for \( m \neq 1 \))
9. \( \int \frac{(\ln x)^n}{x} \, dx = \frac{(\ln x)^{n+1}}{n+1} \), (for \( n \neq 0 \))
10. \( \int \frac{\ln x^n}{x} \, dx = \frac{(\ln x)^n}{2n} \), (for \( n \neq 0 \))
11. \( \int \frac{\ln x}{x^m} \, dx = -\frac{\ln x}{(m-1)x^{m-1}} - \frac{1}{(m-1)^2x^{m-1}} \), (for \( m \neq 1 \))
12. \( \int \frac{(\ln x)^n}{x^m} \, dx = -\frac{(\ln x)^n}{(m-1)x^{m-1}} + \frac{n}{m-1} \int \frac{(\ln x)^{n-1}}{x^m} \, dx \), (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. \( \int \frac{dx}{x(\ln x)^n} = -\frac{1}{(n-1)(\ln x)^{n-1}} \), (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. \( \int \cos(\ln x) \, dx = \frac{x}{2}(\sin(\ln x) + \cos(\ln x)) \)