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Evaluate $\int_1^4 \ln\left(\frac{x}{2}\right)\, dx$

HINT:

Use integration by parts:

$$\int f(x)g(x)\, dx = F(x)g(x) - \int F(x)g'(x)\, dx + C, \text{ such that } F(x) = \int f(x)\, dx$$

This integral is not a common integral so we cannot find it in the integral table. Therefore, it is necessary to introduce something in the integrand in order to solve it.

$$\int_1^4 \ln\left(\frac{x}{2}\right)\, dx = \int_1^4 1 \cdot \ln\left(\frac{x}{2}\right)\, dx$$

Now, take $f(x) = 1$ and $g(x) = \ln\left(\frac{x}{2}\right)$.

We chose $g(x) = \ln\left(\frac{x}{2}\right)$ following the **LIATE** rule.