

Answer on Question #54549 – Math – Integral Calculus

Find:

$$\int (\log x)^2 dx$$

Solution

$$\begin{aligned}\int (\log x)^2 dx &= \int \log^2 x dx = (\text{integration by parts } u = \log^2 x, dv = dx) \\&= x \log^2 x - \int x d(\log^2 x) = x \log^2 x - \int x * 2 \log x * \frac{1}{x} dx = \\&= x \log^2 x - 2 \int \log x dx = \\&= (\text{integration by parts } u = \log x, dv = dx) = \\&= x \log^2 x - 2 \left(x \log x - \int x d(\log x) \right) = \\&= x \log^2 x - 2x \log x + 2 \int x d(\log x) = \\&= x \log^2 x - 2x \log x + 2 \int x * \frac{1}{x} dx = x \log^2 x - 2x \log x + 2 \int 1 dx = \\&= x \log^2 x - 2x \log x + 2x + c = x(\log^2 x - 2 \log x + 2) + c, \\&\text{where } c \text{ is an integration constant.}\end{aligned}$$