

$$\int x^3 \ln x \, dx$$

$$\int u \, dv = uv - \int v \, du$$

$$\begin{aligned} \int x^3 \ln x \, dx &= \ln x * x^4/4 - \int (x^4/4 * 1/x) dx = \\ &= \ln x * x^4/4 - \int (x^3/4) dx = \ln x * x^4/4 - 1/4 x^4/4 + C \\ &= x^4/4(\ln x - 1/4) + C \end{aligned}$$

$$\begin{aligned} u &= \ln x && |d \\ du &= 1/x \, dx \end{aligned}$$

$$\begin{aligned} dv &= x^3 \, dx && |S \\ \int dv &= \int x^3 dx \\ v &= x^4/4 \end{aligned}$$

$$\int \ln x \, dx = \ln x * x - \int (x/x) dx = x \ln x - x + C$$

$$\begin{aligned} u &= \ln x \\ du &= 1/x \, dx \end{aligned}$$

$$\begin{aligned} dv &= dx \\ v &= x \end{aligned}$$

$$\begin{aligned} \int 3x^3 \ln x \, dx &= x^3 * (x \ln x - x) - \int ((x \ln x - x) * 3x^2) dx = \\ &= x^4 * \ln x - x^4 - \int (3x^3 * \ln x - 3x^3) dx = \\ &= x^4 * \ln x - x^4 - 3 \int (x^3 * \ln x - x^3) dx = \\ &= x^4 * \ln x - x^4 - 3 \int (x^3 * \ln x) dx + 3 \int (x^3) dx = \\ &= x^4 * \ln x - x^4 - 3 \int (x^3 * \ln x) dx + 3/4 x^4 + C \end{aligned}$$

$$\int 3x^3 \ln x \, dx = t$$

$$\begin{aligned} u &= x^3 && |d \\ du &= 3x^2 \, dx \end{aligned}$$

$$\begin{aligned} dv &= \ln x \, dx && |S \\ \int dv &= \int \ln x \, dx \\ v &= x \ln x - x \end{aligned}$$

$$\begin{aligned} t &= x^4 * \ln x - x^4 - 3t + 3/4 x^4 + C \\ 4t &= x^4 * \ln x - x^4 + 3/4 x^4 + C \\ 4t &= x^4 * \ln x - x^4/4 + C \\ t &= (x^4 * \ln x - x^4/4) / 4 + C \\ t &= x^4/4 (\ln x - 1/4) + C/4 \end{aligned}$$