Note on natural logarithm integral

We would like to compute

$$I = \int \ln x \, dx \tag{1}$$

We will use the integration by parts as follows

$$\int \ln x \, dx = \left| \begin{array}{rcl} 1 & = & u' \\ \ln x & = & v \end{array} \right| \left| \begin{array}{rcl} u & = & x \\ v' & = & \frac{1}{x} \end{array} \right| = \tag{2}$$

$$x \ln x - \int x \frac{1}{x} \, dx = x \ln x - x + C$$

We may check our result

$$I' = (x \ln x - x)' = \ln x + x \frac{1}{x} - 1 = \ln x \tag{3}$$

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