PROOF OF FORMULA 4.331.2

$$\int_1^\infty e^{-\mu x} \ln x \, dx = -\frac{1}{\mu}\mathrm{Ei}(-\mu)$$

Integrate by parts to obtain

$$\int_1^\infty e^{-\mu x} \ln x \, dx = \frac{1}{\mu}\int_1^\infty \frac{e^{-\mu x}}{x} \, dx.$$

The result now follows via the change $s = \mu x$ and the definition of the exponential integral

$$\mathrm{Ei}(x) = -\int_x^\infty \frac{e^{-t}}{t} dt.$$