

PROOF OF FORMULA 3.352.4

$$\int_0^{\infty} \frac{e^{-\mu x}}{x+b} dx = -e^{\mu b} \operatorname{Ei}(-\mu b)$$

The exponential integral is defined by

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

The change of variable $t = x + b$ gives

$$\int_0^{\infty} \frac{e^{-\mu x}}{x+b} dx = e^{\mu b} \int_b^{\infty} \frac{e^{-\mu t}}{t} dt.$$

The change of variable $s = \mu t$ produces the result.

Note. The parameters are restricted to $b > 0$ and $\mu > 0$.