

PROOF OF FORMULA 3.382.2

$$\int_b^{\infty} (x-b)^{\nu-1} e^{-\mu x} dx = \mu^{-\nu} e^{-b\mu} \Gamma(\nu)$$

Let $t = x - b$ to obtain

$$\int_b^{\infty} (x-b)^{\nu-1} e^{-\mu x} dx = e^{-b\mu} \int_0^{\infty} t^{\nu-1} e^{-\mu t} dt.$$

The change of variables $s = \mu t$ gives

$$e^{-b\mu} \int_0^{\infty} t^{\nu-1} e^{-\mu t} dt = e^{-b\mu} \mu^{-\nu} \int_0^{\infty} s^{\nu-1} e^{-s} ds,$$

and the result follows from the integral representation of the gamma function

$$\Gamma(\nu) = \int_0^{\infty} s^{\nu-1} e^{-s} ds.$$