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

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