

**PROOF OF FORMULA 3.431.1**

$$\int_0^{\infty} (e^{-\mu x} - 1 + \mu x - \frac{1}{2}\mu^2 x^2) x^{\nu-1} dx = -\frac{\Gamma(\nu+3)}{\nu(\nu+1)(\nu+2)\mu^\nu}$$

Integrate by parts to produce

$$\begin{aligned} \int_0^{\infty} (e^{-\mu x} - 1 + \mu x - \frac{1}{2}\mu^2 x^2) x^{\nu-1} dx &= -\frac{\mu}{\nu} \int_0^{\infty} (e^{-\mu x} - 1 + \mu x) x^\nu dx \\ &= -\frac{\mu^2}{\nu(\nu+1)} \int_0^{\infty} (e^{-\mu x} - 1) x^{\nu+1} dx \\ &= -\frac{\mu^3}{\nu(\nu+1)(\nu+2)} \int_0^{\infty} e^{-\mu x} x^{\nu+2} dx \end{aligned}$$

and then let  $t = \mu x$  to obtain the result.