PROOF OF FORMULA 3.351.3

$$\int_0^\infty x^n e^{-\mu x}\,dx = \frac{n!}{\mu^{n+1}}$$

Let $t = \mu x$ to obtain

$$\int_0^\infty x^n e^{-\mu x}\,dx = \frac{1}{\mu^{n+1}} \int_0^\infty t^n e^{-t}\,dt.$$

The integral is $\Gamma(n+1) = n!$, so the formula has been established. An alternative proof is obtained simply by integration by parts.