PROOF OF FORMULA 3.461.2

$$\int_0^\infty x^{2n} e^{-px^2}\, dx = \frac{(2n-1)!!}{2(2p)^n} \sqrt{\frac{\pi}{p}}$$

Let $x = t\sqrt{p}$ to have $px^2 = t^2$. Then

$$\int_0^\infty x^{2n} e^{-px^2}\, dx = \frac{1}{p^{n+1/2}} I_n$$

where

$$I_n = \int_0^\infty t^{2n} e^{-t^2}\, dt.$$

The change of variables $s = t^2$ gives

$$I_n = \frac{1}{2} \int_0^\infty s^{n-1/2} e^{-s}\, ds,$$

that produces the value

$$I_n = \frac{1}{2}\Gamma(n+\tfrac{1}{2}).$$

The expression 8.339.2:

$$\Gamma(n+\tfrac{1}{2}) = \frac{\sqrt{\pi}}{2^n}(2n-1)!!$$

finishes the evaluation.