UNIVERSITY OF CALIFORNIA, SANTA BARBARA

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From Appendix I of Saxon

Gaussian Integrals

$$
\begin{aligned}
I_0 &\equiv \int_{-\infty}^{\infty} e^{-(a+ib)x^2} dx \\
&= \sqrt{\tfrac{\pi}{a+ib}} \\
I_n &\equiv \int_{-\infty}^{\infty} x^n e^{-(a+ib)x^2} dx \\
I_{2m} &= (-1)^m \left(\tfrac{d}{da}\right)^m \sqrt{\tfrac{\pi}{a+ib}} \\
I_{2m+1} &= 0 \\
J_0 &= \int_{-\infty}^{\infty} e^{-\alpha x^2 - \beta x} dx = \sqrt{\tfrac{\pi}{\alpha}} e^{\beta^2/4\alpha} \\
J_n &\equiv \int_{-\infty}^{\infty} x^n e^{-\alpha x^2 - \beta x} dx \\
J_{2m+1} &= (-1)^{2m+1} \left(\tfrac{\partial}{\partial\beta}\right)^{2m+1} \left(\sqrt{\pi/\alpha} e^{\beta^2/x\alpha}\right) \\
J_{2m} &= (-1)^m \left(\tfrac{\partial}{\partial\alpha}\right)^m \left(\sqrt{\pi/\alpha} e^{\beta^2/4\alpha}\right)
\end{aligned}
$$