

PHYSICS 404
4th HOMEWORK-FALL 2019
Prof. V. Lempesis

Hand in: Wednesday 26th of November 2019

1. Use the relation $H_n(x) = (-1)^n e^{x^2} \frac{d^n}{dx^n} (e^{-x^2})$ to find the polynomial $H_4(x)$.
2. Use the relation $L_n(x) = \frac{e^x}{n!} \left(\frac{d}{dx} \right)^n (e^{-x} x^n)$ to find the Laguerre polynomial $L_3(x)$
3. Use the relation $L_n^k(x) \equiv (-1)^k \left(\frac{d}{dx} \right)^k L_{n+k}(x)$ and the result from question 2 to find the associated Laguerre polynomial $L_2^1(x)$
4. Use the recurrence relation $xL_n'(x) = nL_n(x) - nL_{n-1}(x)$ to find the integral $\int_0^\infty x e^{-x} L_m'(x) L_n(x) dx$