

PHY 341 HW Ch.2c

q2-8 Let ψ_n be the n -th stationary state of the SHO with $n > 0$. Find:

(a) $(a_+ a_-)^m \psi_n$; (b) $a_+^m a_-^m \psi_n$, $m < n$. Comment on the results. This is a good problem to ask the tutor.

q2-9

Reduce the following commutators for the SHO to their simplest forms:

(a) $[a_-, a_- a_+]$

(b) $[a_+, a_- a_+]$

(c) $[x, \hat{H}]$

(d) $[p, \hat{H}]$

q2-10 Find the expectation values $\langle x \rangle$, $\langle x^2 \rangle$, $\langle p \rangle$, and $\langle p^2 \rangle$ in the SHO state ψ_2 . Take the operator approach, explicit integration should not be used.

q2-11 Work through the concepts on p. 6 (15.21–15.24) of the following conceptual questions set, <https://jwang.sites.umassd.edu/files/2022/02/1d-infinite.pdf>

This is another good problem to work with the tutor on.