Worksheet #6

(Friday, January 16, 2026)

Name

Questions (5 pts):

Express momentum (and position, if you get to (b)) operators in terms of raising and lowering operators and use the number representation to calculate:

(a) Expectation value of the momentum operator when the quantum harmonic oscillator is an energy eigenstate |n>, i.e.

$<P> = <n|P|n> =$

(b) **If you have time:** expectation value of position operator-squared in an energy eigenstate |n>, i.e.

$<X^2> = <n|X^2|n> =$