Worksheet #4

(Monday, January 12, 2026)

Name

Questions (5 pts):

Consider the number operator $N = a^\dagger a$, where $a^\dagger$ and a are creation and annihilation operators, respectively.

(a) Is $a^\dagger a = aa^\dagger$? In other words, find the commutator $[a, a^\dagger]$

(b) Using the result of (a), express $aa^\dagger$ in terms of the number operator N

(c) **If you have time:** Find the relationship between the Hamiltonian of the 1D harmonic oscillator and the number operator.