S. KIMMEL

Dagger Action on Ket-Bras

$$\left(|\phi\rangle\langle\psi|\right)^\dagger = |\psi\rangle\langle\phi| \quad \text{(switch order)}$$

Pset Question

$$(A+B)^\dagger = A^\dagger + B^\dagger$$

$$\left(I - 2|\psi\rangle\langle\psi|\right)\left(I - 2|\psi\rangle\langle\psi|\right)$$

$$\left(I - 2|\psi\rangle\langle\psi|\right)\left(I^\dagger - 2\left(|\psi\rangle\langle\psi|\right)^\dagger\right)$$

$$= \left(I - 2|\psi\rangle\langle\psi|\right)\left(I - 2|\psi\rangle\langle\psi|\right)$$

$$= I - 2|\psi\rangle\langle\psi| - 2|\psi\rangle\langle\psi| + 4|\psi\rangle\underbrace{\langle\psi|\psi\rangle}_{1}\langle\psi|$$

$$4|\psi\rangle\langle\psi|$$

$$= I$$