Hints: Assignment 1

4b. Express your answer as a superposition of projection operators $|i\rangle\langle i|$, where

$$A|j\rangle = a_j|j\rangle.$$

4c. You answer should be a simple function of $\vec{x}'$ and $\vec{x}''$.

7b. To see what is going on, consider the action of this operator on an eigenvector of A.

10. This can be turned into a straightforward 2×2 matrix problem. Make sure you express your eigenvectors as linear combinations of the given basis kets.

17. If $|E\rangle$ is an eigenvector of H with eigenvalue E, then so is $A_1|E\rangle$ and $A_2|E\rangle$.

20. Note that any normalized vector can be expressed as

$$|\psi\rangle = \cos\alpha|+\rangle + \sin\alpha e^{i\beta}|-\rangle,$$

for suitable choices of the real numbers α, β.