Physics 491: Recitation #6
September 25, 2015

1. For the spinor state,
$$|\chi\rangle = A\big(\, 3i\,|+z\rangle + 4\,|-z\rangle\,\big)$$
Find the normalization constant A. Calculate $\langle \hat{S}_y \rangle$ and ΔS_y.

2. What are the projection operators $\hat{P}_+$ and $\hat{P}_-$ as matricies in the $+z$ basis?
Determine these projection operators in the $+y$ basis.
Find the components of the states $|\pm z\rangle$ in the $+y$ basis and verify that $\hat{P}_+\,|+z\rangle = |+z\rangle$, $\hat{P}_-\,|-z\rangle = |-z\rangle$, $\hat{P}_+\,|-z\rangle = 0$ and $\hat{P}_-\,|+z\rangle = 0$.
If you have time, also check that $\hat{P}_+^2 = \hat{P}_+$, $\hat{P}_-^2 = \hat{P}_-$, $\hat{P}_+\hat{P}_- = 0$ and $\hat{P}_-\hat{P}_+ = 0$.