

- (1) On Homework Report 1, you showed that the representation of S_x in the z -state basis for spin-3/2 is

$$S_x \leftrightarrow \frac{\hbar}{2} \begin{bmatrix} 0 & \sqrt{3} & 0 & 0 \\ \sqrt{3} & 0 & 2 & 0 \\ 0 & 2 & 0 & \sqrt{3} \\ 0 & 0 & \sqrt{3} & 0 \end{bmatrix}.$$

- (a) Find the representation of the eigenstates of S_x in the z -state basis. Call them $|+3/2_x\rangle$, $|+1/2_x\rangle$, $|-1/2_x\rangle$, and $|-3/2_x\rangle$ (that is, just use the m value to label the states).

Hint: you already know the eigenvalues!

- (b) If the state of the system is $|+3/2_x\rangle$ and you measure the spin along the z axis, what values can you obtain, and with what probabilities?
- (c) Find a state of the system for which $\langle S_z \rangle = 3\hbar/4$. If you measure the spin of a system in this state along the x axis, what are the possible results of the measurement, and the probability of each result?