

Physics 751 Homework # 11

Due Wednesday, December 3.

1. A spin-1/2 system is in the eigenstate of the operator $S_x + S_y$ with the largest possible eigenvalue. Find the probability that a measurement of S_z gives $+\hbar/2$.
2. A spin-1/2 object is in an eigenstate of S_x with eigenvalue $+\hbar/2$ at time $t = 0$, the moment when a magnetic field $\mathbf{B} = B \mathbf{k}$ is turned on (\mathbf{k} being the unit vector in the z -direction, as usual). At time T the field is suddenly switched to $\mathbf{B} = B \mathbf{j}$. Another time interval T passes, and S_x is measured. With what probability will the value $+\hbar/2$ be found?
3. Find the matrix representation of the operators J_z , J_x , and J_y in the J^2, J_z basis for angular momentum $3/2$.
4. An angular momentum system $j = 1$ is in the state

$$u = \frac{1}{\sqrt{26}} \begin{pmatrix} 1 \\ 4 \\ -3 \end{pmatrix}.$$

What is the probability that a measurement of J_x of this system will yield zero?

Shankar: 14.4.6, 15.1.2, 15.2.5.