PHYSICS 505/551
2nd HOMEWORK
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Hand in: Thursday 24th October 2013

1. A particle with spin $s = 1$ is at a state with a definite projection $s_x = +\hbar$ along x axis. Calculate the probabilities to find the particle with spin "up" ($s_z = +\hbar$), spin "down" ($s_z = -\hbar$) and spin "horizontal" ($s_z = 0$). Also calculate the corresponding uncertainty Δs_z. (*Hint: You will need to read the Exercise 8 Handout 3*)

2. The state of a particle with spin $s = 1/2$ is described by the vector

$$X = \frac{1}{\sqrt{6}} \begin{pmatrix} 1+i \\ 2 \end{pmatrix}.$$

What are the probabilities to find the particle with spin +1/2 or -1/2 along the z and along the x axis?

3. The state of a particle with spin $s = 1/2$ is described by the vector

$$X = A \begin{pmatrix} 3i \\ 4 \end{pmatrix}.$$

(a) Determine the constant A.
(b) Find the expectation values $\langle s_x \rangle$, $\langle s_y \rangle$, $\langle s_z \rangle$.
(c) Find the "uncertainties" Δs_x, Δs_y, Δs_z.

Please send your answers in pdf form (typed or in clearly handwritten form) in my email address (vlempesis@ksu.edu.sa). Do not forget to put your name and your ID number on it. Also define if you are in phys 505 or phys 551 course.