Chapter 1.5 HW

1. Show that σ_y is a hermitian operator and find its eignenvalues and eigenvectors.
2. Assume a system is in the state described by equation 19, and measurements are made of the spin along the y-direction. (a) What are the possible values you can get? (b) what are the probabilities that you will get each of these values?
3. Consider particles that traverse a Stern-Gerlach device oriented along the y-direction and are deflected upwards (that is their spin along the y-axis is $+\hbar/2$). (a) What percentage of those would then have a spin of $-\hbar/2$ when they traverse a Stern-Gerlach device oriented along the z-direction? (b) Now, of those particles, what percentage will have a spin of $+\hbar/2$ when they traverse a third Stern-Gerlach device oriented along the y-direction?
4. Suppose two particles are prepared in an initial state with total spin zero and then propagate in opposite directions. If one measured the spin along the z-axis of one particle to be $+\hbar/2$, what is the probability that one would find the same spin for the other particle if it is measured along an axis making an angle of 30^o with respect to the z-axis?
5. Draw a Wien diagram (like Figures 5-7) for the probablility that the spin at detector A oriented along the z-axis for one particle of a paired system will not be equal to that measured for the other one at detector B which is oriented at 45^o to the z-axis. Try to draw the diagram to scale but also write in the areas.