PHYS 632: Quantum Mechanics II (Winter 2021)
Exercises 19 January 2021 (Tuesday, Week 3)
Due Monday, 25 January 2021

Exercise 1. Compute numerical values for the following (squared) Clebsch–Gordan coefficients. Remember the notation convention for the coefficients is $\langle j_1\, m_1; j_2\, m_2 | j_3\, m_3\rangle$, where $\mathbf{J}_3 = \mathbf{J}_1 + \mathbf{J}_2$. Come up with a *physical* reason for your answer in each case.

(a) $|\langle 1\,1; 1\,0|3\,1\rangle|^2$

(b) $|\langle 1\,1; 1\,0|1\,(-1)\rangle|^2$

(c) $|\langle 0\,0; 1\,0|1\,0\rangle|^2$

(d) $|\langle 0\,0; 1\,0|0\,0\rangle|^2$

(e) $|\langle 1\,0; 1\,0|0\,0\rangle|^2$

a)
$|\langle 1\,1; 1\,0 | 3\,1\rangle|^2 = 0 \qquad j_1 + j_2 \leq j_3$

b)
$|\langle 1\,1; 1\,0 | 1\,-1\rangle|^2 = 0$

$m_1 + m_2 \neq m_3$

c)
$|\langle 0\,0; 1\,0 | 1\,0\rangle|^2 = 1$

d)
$|\langle 0\,0; 1\,0 | 0\,0\rangle|^2 = 0$

e)
$|\langle 1\,0; 1\,0 | 0\,0\rangle|^2 = \frac{1}{3}$

since $\rightarrow$ $|\langle 1\,0; 1\,0 | 0\,0\rangle|^2 = |\langle 1\,-1; 1\,1 | 0\,0\rangle|^2 = |\langle 1\,1; 1\,-1 | 0\,0\rangle|^2$