## HW#11, Due 9:00am, Dec.30 (Wed). No late HW will be accepted. So turn in whatever you have done.

- 1. (25%) Problem 2.36 in Sakurai. This is the so called Landau levels. Everyone should know it. I don't have time to cover this topic, but you shall work it out by yourself.
- 2. (25%) Problem 2.37 in Sakurai. You shall also read the part on Neutron interferometry on pages 162-163. This experiment showed that a  $2\pi$  rotation of a fermion indeed results in a relative minus sign.
- 3. (25%)Show that
  - (a)  $[\vec{a} \cdot \vec{J}, \vec{b} \cdot \vec{J}] = (\vec{a} \times \vec{b}) \cdot \vec{J}$  and (b)  $tr[(\vec{a} \cdot \vec{J})(\vec{b} \cdot \vec{J})] = -2(\vec{a} \cdot \vec{b}),$

where J is the generator for the usual 3-dim rotation, and  $\vec{a}, \vec{b}$  are the usual 3-dim vectors.

4. (25%) We have shown how to construct the rotation matrices D for the j = 1/2and j = 1 cases. Now it is your term to construct the irreducible rotation matrices D for the j = 3/2 case.

Is its correspondence to SO(3) one-to-one?