1. Baym, Chapter 6, problem 2

2. Baym, Chapter 15, problem 1

3. Suppose orbital angular momentum was allowed to take the value $\ell = \frac{1}{2}$.

   (a) From
   $$L_+ Y_{1/2,1/2}(\theta, \varphi) = 0,$$
   where $L_\pm$ are the differential operators discussed in class, show that
   $$Y_{1/2,1/2}(\theta, \varphi) = A e^{i\varphi/2} \sqrt{\sin \theta}$$
   where $A$ is a normalization constant.

   (b) Try to construct $Y_{1/2,-1/2}(\theta, \varphi)$ in two ways:
   - Act with $L_-$ on $Y_{1/2,1/2}$; and
   - Demand that $L_- Y_{1/2,-1/2}(\theta, \varphi) = 0$,
   and show that there is a contradiction. (This is an argument against half-integer angular momentum).