Your Answers to these problems will be collected in class on Aug. 31.

1. Show by direct calculation, using Eqs.(1.20-1.24), that

$$L_+L_- + L_z^2 - L_z = L^2$$
$$L_-L_+ + L_z^2 + L_z = L^2$$

   Hint: To avoid excessive pain in carrying out the differentiations, use Mathematica or Maple and print out the Maple worksheet or Mathematica notebook.

2. Write a Maple or Mathematica routine to obtain formulas for $\Theta_{l,m}(\theta)$ for $l = 4$ and $m \leq l$ using Eq.(1.36). With the aid of your results, give explicit formulas for $Y_{4,m}(\theta, \phi)$, $m = -4 \cdots 4$. Verify by direct calculation that $Y_{4,m}(\theta, \phi)$ are properly normalized.