Study section 3.3.2 and answer the following questions (be sure to show your work).

- 1. Evaluate the following integrals. (Hint: if you use the orthogonality condition for Legendre polynomials discussed in the text, there's no need to actually work them out by brute force!)
  - (a)  $\int_{0}^{\pi} P_{2}(\cos\theta) \cdot P_{2}(\cos\theta) \sin\theta \, d\theta =$ (b)  $\int_{0}^{\pi} P_{7}(\cos\theta) \cdot P_{7}(\cos\theta) \sin\theta \, d\theta =$ (c)  $\int_{0}^{\pi} P_{2}(\cos\theta) \cdot P_{7}(\cos\theta) \sin\theta \, d\theta =$
- 2. In Example 3.9, fill in the mathematical steps required to go from Eq. 3.82 to Eq. 3.84. (Note: I am not asking you to simply write down what's already in the text fill in the gaps).

3. In Example 3.9, suppose the surface charge density is constant,  $\sigma_0(\theta) = \sigma_0$ . Evaluate Eq. 3.84 for this special case, and show that the potential inside the sphere (Eq. 3.78) is what you expect it to be. (Hint: if you recognize that  $\sigma_0 = \sigma_0 \cdot 1 = \sigma_0 \cdot \rho_0(\cos\theta)$ , Eq. 3.84 is easy to evaluate!)