Griffiths reading: 2.4.3-4 and 2.5 (i.e., finish Ch. 2!)

1. [5 points] This problem refers to the situation of Griffiths Problems 2.16 (HW 3) and 2.24 (HW 4); you may use the results from those previous problems.
   (a) Check that the previous solution for the electric field is consistent with Eq. 2.33 at both the inner radius \( a \) and the outer radius \( b \).
   (b) Extend your previous solution to Griffiths 2.24 a little bit so that you have \( V(r) \) in all three regions, where \( O \) is on the axis. Check that this \( V(r) \) satisfies Eq. 2.34 and 2.36 at both the inner radius \( a \) and the outer radius \( b \).

2. [5 points] Griffiths 2.34 (Energy of uniformly charged solid sphere). For your convenience, previous results are:

   \[
   E = \frac{1}{4\pi\varepsilon_0} \frac{qr}{R^3} \quad \text{and} \quad V = \frac{1}{4\pi\varepsilon_0} \frac{q}{2R} \left( 3 - \frac{r^2}{R^2} \right) \quad \text{for } r < R
   \]

   \[
   E = \frac{1}{4\pi\varepsilon_0} \frac{q}{r^2} \quad \text{and} \quad V = \frac{1}{4\pi\varepsilon_0} \frac{q}{r} \quad \text{for } r > R
   \]

3. [5 points] Griffiths 2.42 (force between hemispheres). Hint: This looks very hard until you realize that what you want is equal to the force on the upper hemisphere coming from all charges, since the force on the upper hemisphere coming from charges on the upper hemisphere must add up to zero (why?). The force on the upper hemisphere coming from all charges is then just given by integrating (2.51) over the hemisphere. (But be careful, the integrand is a non-constant vector...)