1. [3 points] Working with Dirac delta functions:
   (a) Describe in words the nature of the charge distribution
   \[ \rho(r) = q_0 \delta^3(r - \frac{L}{2} \hat{z}) - q_0 \delta^3(r + \frac{L}{2} \hat{z}) \]
   What is the total charge contained in this charge distribution?
   (b) Same for the charge distribution \( \rho(r) = \rho(s, \phi, z) = A \delta(z - z_0) \delta(s - R) \).
   (c) Express the charge distribution in spherical coordinates for an infinitesimally thin, uniform spherical shell of radius \( R \) carrying total charge \( Q \).

2. [4 points] Find \( \rho \) from \( V \) or \( E \):
   (a) Given the cylindrically symmetric electric potential \( V(s) = B \sqrt{s} \), find the charge distribution \( \rho(s) \).
   (b) Given the spherically symmetric electric field \( \mathbf{E}(r) = A \exp(-r^2/b^2) \hat{r} \), find the charge distribution \( \rho(r) \).

3. [2 points] Griffiths 2.29 (check Eq. 2.29).

4. [4 points] This is essentially part (b) of 2.25:
   (a) Use Eq. (2.29) [in the form of the first of the equations in (2.30)] to find the potential at point \( P \) a distance \( z \) above the center of the line-segment charge distribution of Fig. 2.34(b).
   (b) Then compute \( \mathbf{E} = -\nabla V \), and compare your answer with the result of Example 2.2.

5. [3 points] Griffiths 2.30 (check boundary conditions).
   Do parts (a) and (b) only; skip part (c)! Note that in part (a), Problem 2.11 was not assigned in homework, but we did it in class.

6. [4 points] Griffiths 2.31 (assembling point charges).