

Lesson #3: Volume Charge Distributions

Name: _____

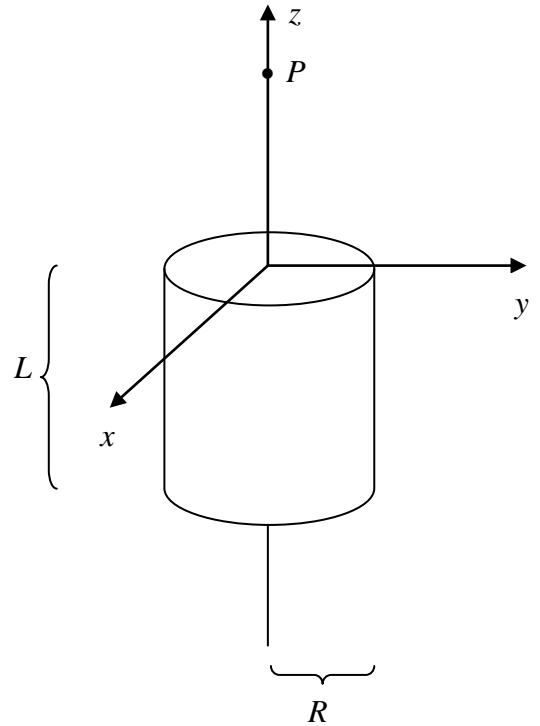
Due M3

Review the in-class example from Lesson 2 (finding the electric field above a circular disk of charge) and answer the following questions.

Suppose we wanted to find the electric field along the axis of a cylinder of charge, at a distance z from one end of the cylinder. The cylinder has radius R , length L and is uniformly charged throughout its volume with total charge Q .

1. Sketch a representative differential volume element for cylindrical coordinates, $d\tau = s \, ds \, d\phi \, dz$.
2. Sketch the vectors \vec{r} , \vec{r}' and \vec{r} .
3. Specify the separation vector \vec{r} in cylindrical coordinates.

4. What is the volume charge density ρ ?



5. Completely specify, but do not evaluate, the integral (Eq. 2.8 in Griffiths) required to find the electric field at point P . Your answer should be in terms of the given parameters. Include limits of integration.