In-class problems, Wed Feb 21 2018

23.4-23.5 E of rings, disks, planes, parallel plate capacitor

1. Consider a half ring of charge. Determine $\vec{E}$ at the center of the ring.

   (a) Sketch $\Delta\vec{E}$ from a segment Δq.
   (b) Identify the components you need to calculate. Identify a useful angle.
   (c) You're integrating over the arc s. Here $\Delta q = \lambda\Delta s$ and $\Delta s = \text{radius}\Delta\theta$. Sub both of these in. That is, instead of integrating over the charge dq, we'll integrate over the angle $d\theta$
   (d) Determine E. This is an integral you're expected to evaluate.

2. Determine an expression for $\vec{E}$ at the indicated point.

   Leave terms as integrals, but be sure to move out all constants and include limits of integration.

3. $\vec{E}$ for ring of charge along its axis is

$$E = \frac{kQx}{(x^2 + R^2)^{3/2}}$$

   Determine E
   (a) very far away. What limit are you taking? Yes, it goes to zero. How does it go to zero? Your function should have some kind of dependence with x.
   (b) Repeat for a point very close to the center.

4. Consider the parallel plate capacitor, modeled as two infinite charged sheets spaced d apart.

   (a) Find $\vec{E}_{\text{total}}$ to the left of the plates. Draw $\vec{E}$ from the + plate, and $\vec{E}$ from the - plate. Use superposition.
   (b) Repeat to find $\vec{E}_{\text{total}}$ to the right of the plates.
   (c) Repeat to find $\vec{E}_{\text{total}}$ between the plates.

   The parallel plate capacitor is an often used system. It's the configuration that gives a *uniform* $\vec{E}$. That is, one where $\vec{E}$ is the same everywhere (as long as you're between the plates).

Due Fri Feb 23 2018, beginning of class

23.5-23.7 parallel plates, motion in E

Describe the motion of dipole in a uniform electric field. In addition to text, add a diagram.

23.21 in the workbook

23.25 in the workbook