PHYS 5C:

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I. Eletric fields

- $\sigma = \frac{\text{charge}}{\text{area}} = \frac{Q}{\pi R^2}$ A disk is a bunch of rings.

  Re-use ring result, integreat rings over surface

- $E = \frac{\sigma}{2\epsilon_0}\left[1 - \frac{z}{(z^2+R^2)^{\frac{1}{2}}}\right]$

- Test charges are positive

- Infinite plane

  z>R $E \approx \frac{Q}{4\pi\epsilon_0 z^2}$

  z<R $(R \to \infty)$ $\frac{\sigma}{2\epsilon_0}$ distance away from x does not change density

- Infinite Line charge $E = \frac{\lambda}{2\pi\epsilon_0 r}$ charge is out wards perpindicular to the line.

II. Conductors

- Conductors have charges that are free to move around.

- Insulators have charges that cannot move

- In electrostatics $E = 0$ inside a conductor

- Just outside the surface of a conductor, $E \perp$ to surface

III. Gauss Law in integral form

- Gauss law is good for insights on eletrical fields and sometimes useful technique to calculate E and to find charge density.

- All concentric sphereical shells have the same EA

- $I_e = \int E \, \mathrm{dA} = \frac{Q}{\varepsilon_0}$