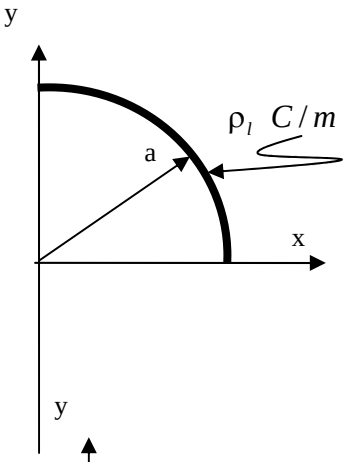
KING FAHD UNIVERSITY OF PETROLEUM AND MINERALS

Department of Electrical Engineering

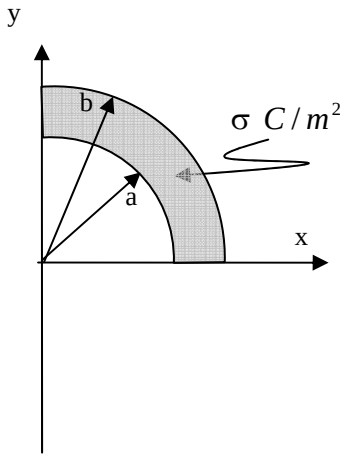
EE 340 Electromagnetic

Homework 2 (Due Wednsday October 24)

1- A line charge with the shape shown below lies in the x-y plane. Its charge density is $\rho_l\ C/m$. Find the magnitude and direction of the electric field intensity at the origin.



2- A surface charge with the shape shown below lies in the x-y plane. Its charge density is $\sigma\ C/m^2$. Find the magnitude and direction of the electric field intensity at the origin.



3- A long cylinder of radius 0.2 *m* lies along the *z* axis and carries a uniform surface charge density of 10 mC/m^2. Calculate the flux passing through a window at $\rho = 2$ m, $\pi/4 \le \phi \le 3\pi/4$, and $2 \le z \le 4$.

4- A charge distribution of the following form is set up in air:
$\rho_v = 10^{-6} e^{-r}\ C/m^3$, where *r* is the radial distance of he spherical coordinates.
Find the electric field intensity $\overline{E}$ everywhere.

5- Given the volume charge distribution in cylindrical coordinates as

$$\rho_v = \begin{cases} 12\rho \quad nC/m^3, & 1 < \rho < 2 \\ 0, & otherwise \end{cases}$$

Calculate the electric field intensity $\overline{E}$ everywhere.

6- Three concentric spherical shells $r = 1$, $r = 2$, $r = 3$ m, respectively, have charge distriutions 2, -4 and 5 $\mu C / m^2$.

a. Calculate the flux through $r = 1.5\, m$ and $r = 2.5\, m$.

b. Find $\overline{D}$ at $r = 0.5\, m$, $r = 2.5\, m$, and $r = 3.5\, m$.

7- The charge density in free space is given as a function of a spherical radius as

$$\rho_v = \begin{cases} \rho_0 r & 0 < r \le a \\ 0 & r > a \end{cases}$$ Find $\overline{E}$.