VE230 Homework 2

2020 Summer

P.3-8 A line Charge of uniform density ρ_l in free space forms a semicircle of radius b. Determine the magnitude and direction of the electric field intensity at the center of the semicircle.

P.3-9 Three uniform line charges– ρ_{l_1}, ρ_{l_2}, and ρ_{l_3}, each of length L–form an equilateral triangle. Assuming that $\rho_{l_1} = 2\rho_{l_2} = 2\rho_{l_3}$, determine the electric field intensity at the center of the triangle.

P.3-12 Two infinitely long coaxial cylindrical surfaces, $r = a$ and $r = b(b > a)$, carry surface charge densities ρ_{sa} and ρ_{sb}, respectively.
a) Determine **E** everywhere.
b) What must be the relation between a and b in order that **E** vanishes for $r > b$?

P.3-13 Determine the work done in carrying $a{-}2(\mu C)$ charge from P_1(2,1,-1) to $P_2(8, 2, -1)$ in the field $\boldsymbol{E} = \boldsymbol{a_x} y + \boldsymbol{a_y} x$.
a) along the parabola $x = 2y^2$
b) along the straight line joining P_1 and P_2.

P.3-16 A finite line charge of length L carrying uniform line charge density ρ_l is coincident with the x-axis.
a) Determine V in the plane bisecting the line charge.
b) Determine **E** on the bisecting plane from ρ_l directly by applying Coulomb's law.
c) Check the answer in part(b) with $-\nabla V$.

P.3-19 A charge Q is distributed uniformly over the wall of a circular tube of radius b and height h. Determine V and **E** on its axis.
a) at a point outside the tube, then
b) at a point inside the tube.