MIDTERM EXAMINATION

Electromagnetics

Question 1

An infinitely long hollow semicylinder of radius R has a uniform surface charge density ρ_S.

a. What is the electric field intensity along the axis of the cylinder?
b. Use the result of (a) to find the electric field intensity along the axis due to a semicylinder of uniform volume charge density ρ_v?

Question 2

Find the total charge enclosed within each of the following volumes for the corresponding electric field intensity:

a. $\mathbf{E} = Ar\mathbf{a}_r$ for a sphere of radius R?
b. $\mathbf{E} = A\rho^2\mathbf{a}_\rho$ for a cylinder of radius R and length L?

Question 3

A line charge density ρ_L of length L lies parallel to a infinite sheet of surface charge density ρ_S. How much work is required to rotate the line charge so that it is vertical?