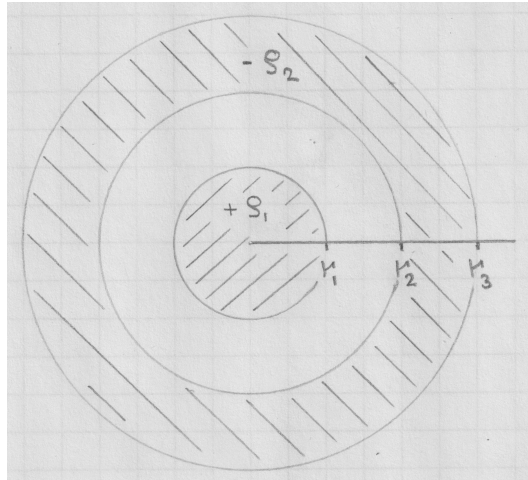


[lex47] Electric field of uniformly charged coaxial cylinders

Consider (as shown in cross section) a solid cylinder of radius r_1 surrounded by a cylindrical shell of inner radius $r_2 = 2r_1$ and outer radius $r_3 = 3r_1$. The inner cylinder is uniformly charged with positive charge density ρ_1 and the shell with negative charge density $-\rho_2$. Assume that the length l of cylinder and shell is much larger than the outer radius r_3 .

- (a) Determine the electric field $E(r)$ for $0 < r < r_1$ and for $r_1 < r < r_2$.
 - (b) Determine the ratio ρ_2/ρ_1 such that the electric field vanishes at $r > r_3$.
 - (c) Determine the electric field $E(r)$ for $r_2 < r < r_3$.
- Express all results in terms of ρ_1 and r_1 .



Solution: