Homework 5.

1) Find the current in the circular wire shown in Fig.1 if the current density is $\vec{j} = 10e^{-100\rho}\hat{a}_z \quad (A/m^2)$. The radius of the wire is 3 mm.

2) A conductor of uniform cross section and 100 m long has a voltage drop of 3 V and a current density of $2.5\times10^5 \ A/m^2$. What is the conductivity of the material?

3) Consider a conducting spherical shell of radius R, assume that a point charge Q is placed at its center. Find the expressions of electric field for $0 < r < R$ and $r > R$, respectively.

4) Consider a point charge q =2 μC located a distance 1 m above a perfect conducting plane of infinite extent as in Fig.1. Determine the electric field at point (2, 2, 2) m.

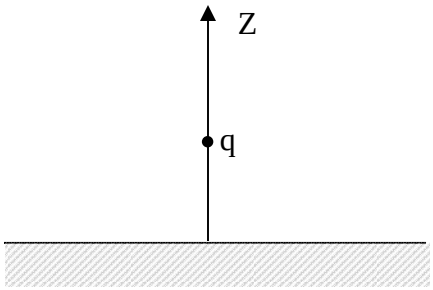

Fig. 1