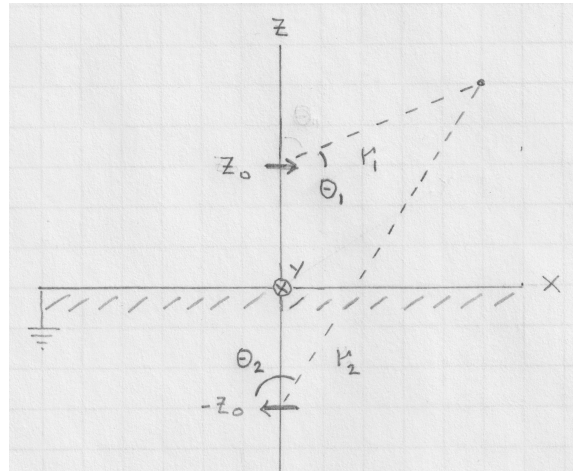


## [lex15] Electric dipole near plane conducting surface II

When an electric dipole is placed near a plane conducting surface, its electric field initially penetrates the conductor. The mobile charge carriers rearrange themselves toward electrostatic equilibrium such that the electric field is zero inside the conductor and directed perpendicular to the surface just outside the conductor.

Consider the case where the conductor fills the space at  $z < 0$  and the electric dipole is oriented in  $x$ -direction,  $\mathbf{p} = p_0 \hat{\mathbf{i}}$ , and placed on the  $z$ -axis at  $z_0 > 0$ .

- Use the method of images and symmetry considerations to calculate the profile of the surface charge density  $\sigma(x)$  along the  $x$ -axis.
- Find the location  $\pm x_0$  where the surface charge density  $\sigma$  has a maximum or a minimum.
- Explain the decay law at large  $x$  of the induced surface charge density and electric field at near the surface.



**Solution:**