

Physics 425, Spring 2012

Assignment set #1

Due Jan 18:

1. In this problem, you will study the boundary conditions of the electric and magnetic fields. Suppose that we measure the electric field and magnetic field across a surface dividing two linear materials. The material below the surface has the permittivity and permeability as ϵ_1 and μ_1 , and the material above the surface has the permittivity and permeability as ϵ_2 and μ_2 . There is no free charge and no free current on the surface.
 - (a) The electric field vector \vec{E}_1 below the surface is inclined toward the surface by 45° . Find the angle θ_E between the surface and the electric field vector above the surface \vec{E}_2 .
 - (b) The magnetic field vector \vec{B}_1 below the surface is inclined toward the surface by 45° . Find the angle θ_B between the surface and the magnetic field vector above the surface \vec{B}_2 .
 - (c) If it is vacuum below the surface, discuss what θ_E and θ_B are like, i.e., is the electric field and magnetic field vectors above the surface more, or less, inclined toward the surface, and why?