

Chapter 2 Problems

1. Proof: implicit in the Maxwell equations is the continuity equation for charge density and current density.

2. Use Gauss's theorem to prove the following:

(a) Any excess charge placed on a conductor must lie entirely on its surface.

(A conductor by definition contains charges capable of moving freely under the action of applied electric fields).

(b) The electric field at the surface of a conductor is normal to the surface and has a magnitude σ/ϵ_0 , where σ is the charge density per unit area on the surface.

3. Use the boundary condition on magnetic field, \vec{H} , to prove the following:

(a) The boundary condition on \vec{H} at the surface of a material of very high permeability is the same as for the electric field at the surface of a conductor.

(b) The surface of the high permeability material is equipotential, and the lines of \vec{H} are normal to the equipotentials.