HW4 Due March 4 11.59 pm

1) For Maxwell stress tensor show that

a) $\int_{\partial V} T_{ij} n_j \, dS = \int_V \rho E_i \, dV$ $\quad \vec{n}$ is normal of S

b) Use this to calculate the force between two halves of a uniform hollow charged sphere.

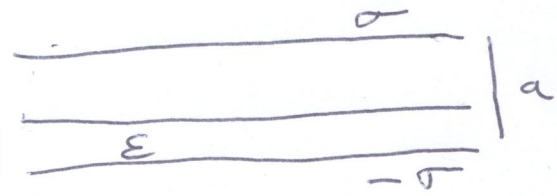
2) a) Calculate the Green's Function of a grounded sphere

b) Calculate the Green's Function of an isolated sphere

Hint: use method of images

3) Find the potential of a sphere with radius a and dielectric constant ε placed in an external field $\vec{E}$. Do this using an expansion in spherical harmonics

4. Consider two infinite conducting planes with charge density $-\sigma$ and σ separated by a. There is a dielectric with thickness h, see figure and vacuum above that.



a) Determine the $\vec{E}$, $\vec{D}$ and $\vec{P}$ fields in between the planes.

b) What is the surface charge density on the upper side of the dielectric?