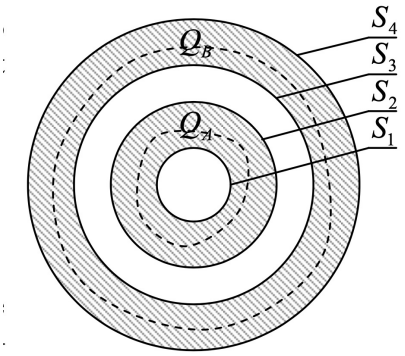
Electromagnetic Theory

Problem Set #2 (8.311)

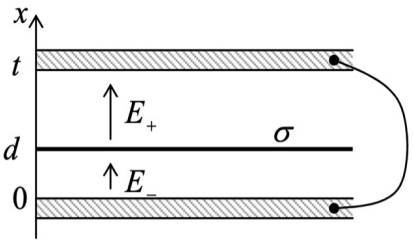
[Due Wed. Feb 16, 2022]

Problem 2.2. Electric charges Q_A and Q_B have been put on two metallic, concentric spherical shells – see the figure on the right. What is the full charge of each of the surfaces S_1-S_4?

(20 Pts)



Problem 2.6. A wide, thin plane film, carrying a uniform electric charge density σ, is placed inside a similarly wide plane capacitor, whose plates are connected with a wire (see the figure on the right) and were initially electroneutral. Neglecting the fringe effects, calculate the surface charges of the plates, and the net force exerted upon the film (per unit area).



(30 pts)

Problem 2.29. Use the image charge method to calculate the full surface charges induced in the plates of a very broad, externally-unbiased plane capacitor of thickness D by a point charge q separated from one of the electrodes by distance d.

(50 pts)

Problem 2.32. Use the method of images to find the Green's function of the system shown in the figure on the right, where the bulge on the conducting plane has the shape of a semi-sphere of radius R.

(50 pts)