

PHY505 - Classical Electrodynamics
Homework No. 4
Due: Monday, October 7, 2002

1. Jackson 1.22
2. Jackson 1.23

In part (c) use the the relaxation equation for the “cross.”

For definition of capacitance see Jackson, Sec. 1.11.

3. A point charge q is confined in the region between two parallel grounded infinite conducting plates. Let d be the distance between the plates and x be the displacement of the charge from the mid-plane.
 - (a) Use multiple image charges to obtain an expression for the force on the particle.
 - (b) Obtain approximate expressions for the force in two limiting cases.
 - i. the particle is near the mid-plane at $x = 0$.
 - ii. the particle is near the plate at $x = d/2$.
 - (c) In the Millikan oil drop experiment a small oil droplet carrying a few excess electronic charges is situated between 2 parallel plates, which are maintained at a potential difference V . The image force on the droplet is neglected. Is this a serious error?