

## PHYS 703 - Electrostatic Energy and the Variational Approach

1. Consider a solid conducting sphere with total charge  $Q$ .
  - a) Obtain the total electrostatic energy using eq. (1.54) in Jackson.
  - b) Obtain the total electrostatic energy using eq. (1.53) in Jackson.
  - c) Obtain the total electrostatic energy using eq. (1.52) in Jackson.
2. Ignoring spherical symmetry we might try a potential of the form

$$\Phi(\vec{x}) = \frac{(a + b \cos \theta)}{r}$$

for the potential due to a charge on a solid conducting sphere.

- a) Determine the electric field and the surface charge density on the sphere using the expression above.
- b) Determine the constants  $a$  and  $b$  by requiring that the total charge be  $Q$  and utilizing the variational principle specified by eq. (1.63) in Jackson.