

Problem 2.37. Calculate the 2D Green's function for the free spaces:

- (i) outside a round conducting cylinder, and
- (ii) inside a round cylindrical hole in a conductor.

(30 pts)

Problem 3.2. A plane thin ring of radius R is charged with a constant linear density λ . Calculate the exact distribution of the electrostatic potential along the symmetry axis of the ring, and prove that at large distances, $r \gg R$, the three leading terms of its multipole expansion are indeed correctly described by Eqs. (3.3)-(3.4) of the lecture notes.

(50 pts)

Problem 3.6. An electric dipole is located above an infinite, grounded conducting plane. Calculate:

- (i) the distribution of the induced charge in the conductor,
- (ii) the dipole-to-plane interaction energy, and
- (iii) the force and the torque acting on the dipole.

(40 pts)

Problem 3.7. Calculate the net charge Q induced in a grounded conducting sphere of radius R by a dipole \mathbf{p} located at point \mathbf{r} outside the sphere – see the figure on the right.

(30 pts)

