Physics 8100 - Electromagnetic Theory I

Fall 2017 **N. Dietz**

Assignment # 8 (due to Monday, November 27, 2017)

Problem 1: *(20 points)*

A line charge density $\sigma(\vartheta) = K \cdot \cos(\vartheta)$ is glued over the surface of a spherical shell of radius R, where K is a constant. Find the resulting potential inside and outside the sphere.

Problem 2: *(20 points)*

A line charge density is distributed on the z-axis from z = -a to z = a. Using the method of Green's function, find the potential for r > a to the order of $(a/r)^5$.

Problem 3*: (20 points)*

A sphere of radius R carries the charge density

$$\rho(\vec{r}) = \frac{A\,(1 - \cos\theta)}{r^2},$$

where A is a constant. Find the potential far from the sphere.

Problem 4: *(20 points)*

Find the electric field inside and outside a dielectric sphere of radius R that has a uniform polarization vector **P**.

Problem 5: *(20 points)*

A plane interface separates two semi-infinite dielectric media with dielectric constants ε_1 and ε_2. The surface may be taken as the plane z = 0. A charge q in the dielectric ε_1 is at (0, 0, a) and a charge –q in the dielectric ε_2 is at (o, 0, -a). Find the forces between these two charges (hint: use the method of images and apply the proper boundary conditions).