

## Physics 423, Spring 2019

### Homework Set # 5

1. Due Wednesday, Feb 6 (Read §2.2.3):
  - (a) Find the electric field inside and outside a sphere with uniform charge density  $\rho$ .
  - (b) Two identical spheres, radius  $R$  and uniform charge density  $\rho$ , are centered at  $x = \pm a$ , where  $a < R$ . Where these spheres overlap, the charge density is  $2\rho$ . Find the electric field everywhere. You may begin with the solution to 1a.
2. Due Friday, Feb 8 (Read §2.3):
  - (a) For each of the following, either demonstrate that the electric field is impossible, or find the electric potential and the charge density. Note that  $A, k, a, b$  are constants.
    - i.  $\mathbf{E} = Ay\hat{\mathbf{z}}$ .
    - ii.  $\mathbf{E} = Ae^{-kr}\hat{\mathbf{r}}$ .
    - iii.  $\mathbf{E} = \frac{A\hat{\mathbf{s}}}{s}$  for  $a < s < b$ , zero elsewhere.
  - (b) An infinitely long rod has radius  $R$  and constant volume charge density  $\rho$ .
    - i. Find the electric field inside and outside the rod. Sketch the magnitude  $E(s)$
    - ii. Let  $V = 0$  at the center of the rod. Find and sketch the potential  $V(s)$  inside and outside the rod.
3. Due Monday, Feb 11:
  - (a) Griffiths problem 2.25
  - (b) Griffiths problem 2.29