PHYS 401: Electricity & Magnetism I
Due date: Wednesday, April 5, 2023

Problem Set #8

1) Problem 3.44: Rod of charge

2) Problem 3.47: Dipoles and the average electric field

3) Ring of charge

Consider a uniformly charged ring of radius R and total charge Q.

a) Model the ring as a very thin equatorial band of a spherical shell. Shows that in spherical coordinates the charge density can be written as $\sigma(\theta) = \frac{Q}{2\pi R^2}\delta(\theta - \pi/2)$.

b) Calculate the potential $V(r, \theta)$ everywhere due to this ring of charge using separation of variables.
Note: The answer is an infinite sum.

c) Use the multipole expansion to calculate the potential $V(r, \theta)$ for the ring.