Physics 5B (Spring 2023): Homework #3

Please submit on online before 6:00 pm on Monday, February 13, 2022.

Exercise 1.61 The energy required to assemble a sphere of uniform charge. The problem refers to Section 1.15 where the energy is calculated using the energy density of an electric field. This is a topic we haven't treated yet. In any case, the problem asks you to use arguments that we have covered: namely that the stored energy is equal to the work done to assemble the sphere. So, you should assemble the sphere one onion-like layer at a time and calculate the work done to bring the layer from infinity to just touching the outer layer of the sphere that you are building.

Exercise 1.63 Here a test charge initial infinitely far away reaches a certain point near a charge distribution. Use conservation of energy to determine its final velocity.

Exercise 2.47 Potential at the center of disk compared to a square of charge.

Exercise 10.20 Work done moving a point charge in the field of a dipole

Exercise 10.28 Force on a dipole caused by the field of two other dipoles.

Exercise 10.27 Pascal's triangle and multipole expansion (optional just for fun).