02ELMA - Homework 3

Assigned for the week of Mar 2, 2025

Questions

1. Four equal charges, $+q$, are located at the corners of a square with side length a. What is the net electric field in the center of the square? If we replace one of the charges with $-q$, what would be the electric field and what would be the net force on a test charge Q in the center?

2. Find the electric field a distance z above the center of a circular loop of radius r, which carries a uniform line charge λ.

3. Find the electric field inside and outside of a charged sphere with charge density $\rho = kr$, where k is a constant and r is the distance from the center of the sphere.

4. Depending on the result of Q3, calculate the potential inside and outside of the sphere.

5. If you consider the situation in Q1 again (four equal charges, $+q$, are situated at the corners of a square), how would the field lines look?