Mapping an Electric Field Practice

Review the Textbook on Electric Fields and Electric Field Lines:

- **Phys 1402:** Serway/Vuille: Sections 15.4, 15.5, and Quick Quiz 15.6.
- **Phys 2426:** Serway/Jewett: Sections 23.4, 23.6, Quick Quiz 23.5.

1. A dust particle has 2.4×10^8 extra electrons. What is the charge of the dust particle?
(-3.84×10^{-11} C $= -0.0384$ nC)

2. A charge of 4.67nC is placed in the electric field of 2.14 N/C. Calculate the force exerted on the charge by the field.
(9.99×10^{-9} N or 9.99nN)

3. Calculate an electric field in a point 2.6 cm away from a charge $Q = -9.7$ nC
(1.3×10^5 N/C)

4. What is the direction of the electric field in question #3?
(Inward, towards the charge)

5. Two small steel ball bearings have the same radius and they are located 1.2 m apart. One has a charge of +3 μC, while the other has a charge of −5 μC. What is the electric force they exert on each other?
(94 mN, attractive)

6. The steel balls from question #5 are brought in contact with each other, and then replaced in their original positions. What charge does each ball have now?
(Each ball has −1 μC of charge.)

7. Now, what is the electric force the ball bearings exert on each other?
(6.3 mN, repulsive)

8. From the sketch of the field lines shown in Figure 1 determine the ratio Qa/Qb (including the sign)
(+4. Note: Both charges are + because the E-Field points away.)

9. From the sketch if the field lines shown in Picture 2, determine the signs of charges (+ or −) placed in points A, B, and C.
(A is positive and B&C are negative. Note that the field points away from the labeled + charge. Following the field lines tells us it points toward B and C. Following on from there, the field points away from A.)

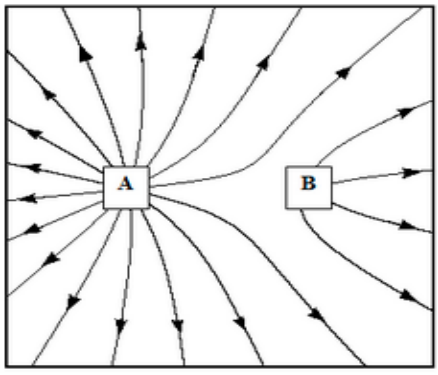

Figure 1: Field Lines from two Charges

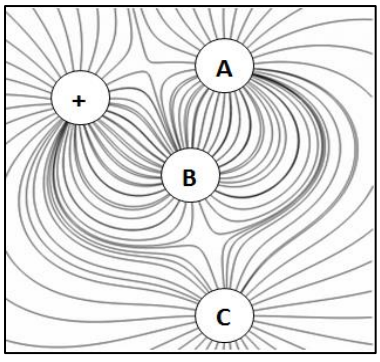

Figure 2: Field Lines from Multiple Charges