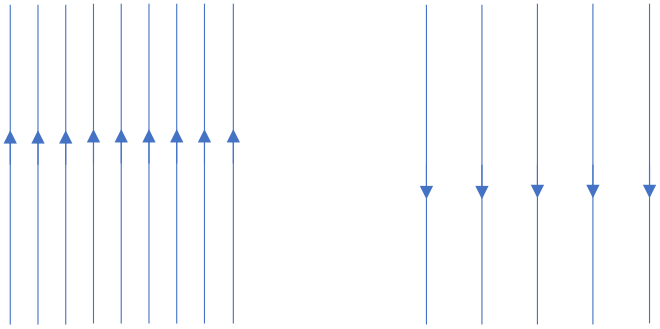
Homework Problem Set 10 – Due THURSDAY, 12/1

Problem 1

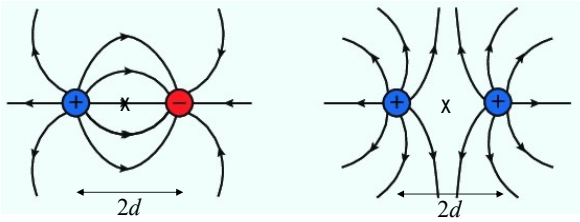


The figure to the left shows two different electric field configurations. Describe how those fields differ from each other! Which one is the stronger field? Which direction does the field point? Where do you expect the positive and negative charges to be located that produce these field configurations?

Problem 2

A charge of 0.1 μC moves from one point in space to a different point in space which has a potential that is 100 MV (Mega-Volt) higher than the first point. By how much does the potential energy of that charge change?

Problem 3



A single positive charge Q produces an electric field E_1 at a distance d from its center. What is the electric field produced by **two** charges, a distance 2d apart, at the midpoint between those two charges (marked X), if

a) both charges have equal magnitude but opposite sign (Q and -Q, left figure)
b) both charges have equal magnitude Q and same sign (right figure).

Problem 4

A charge of +0.1 C inside a homogenous electric field experiences a force of 5000 N in the +x-direction. What is the magnitude of that electric field? Which way does it point relative to the direction of the force on the charge?

Problem 5

What is a better analogy for an electric circuit: A sink where water runs out the drain, or the radiator heating system in a house where water is being circulated between the radiators and the boiler? Explain your reasoning!

Problem 6

Think of a thin, long rod of metal as a resistor with a certain resistance R.

a) If we cut the rod in half so each part has only ½ the length, what would be the resistance of each part? (Think of this in terms of series circuits as analogy).

b) If we now place the two halves next to each other so they make contact and form a new rod with half the length but double the cross-sectional area as the initial one, what would be the resistance of that rod? (Think of parallel circuits).

Extra Credit Problem: Solve Hewitt Problem 94 p. 450