In-class problems, Tue Feb 18, 2020

22.2, 22.3 E from point charges, dipole

1. *From yesterday...*

   A point charge of $-10\mu C$ is at (-3, -1).

   (a) Sketch this problem.
   (b) Calculate the electric field at (2,2). Give a magnitude and direction, or components.
   (c) Determine the position (x,y) at which the electric field will be 36 kN/C pointing at -30^o.

2. We use summation notation a lot in this course (and later courses, as well as professional work).

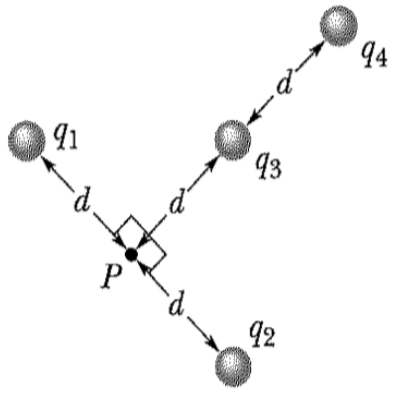
   Write the first 3 terms for each of the following

   (a)
   $$\sum_{i=1}^{N} \frac{x^i}{i+4}$$

   (b)
   $$\sum_{m=3}^{N} \frac{kq_0}{(r_m - r_0)^2}$$

   (c) Write the following using summation notation
   $$S = e^{-4\theta} + e^{-2\theta} + 1 + e^{+2\theta} + e^{+4\theta}$$

3. Determine the magnitude and direction of the electric field at point P due to the particles.

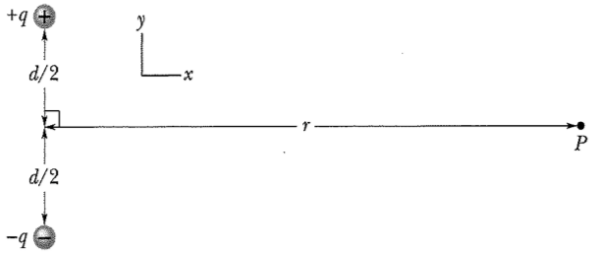


   (HRW 22-8)

4. Consider the electric dipole below. Determine

   (a) the magnitude and direction of the electric field at point P.

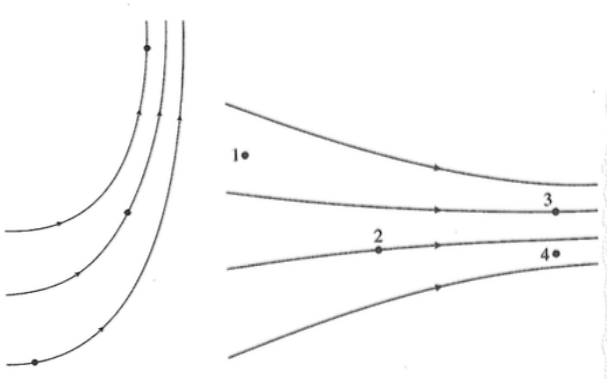
   (b) an expression for $\vec{E}$ in the limiting case of $r \gg d$.



   (HRW 22-19)

5. *From yesterday...*

   Electric field lines in two regions of space are given below. Draw the electric field vectors at the dots. The length of the vector should indicate the relative strength of $\vec{E}$ at that point.



Due Wed Feb 19, 2020, beginning of class

22-4 E of a line of charge

1. (Review) Determine the following integral
   $$\int_{x_a}^{x_b} \frac{dx}{(x^2+y^2)^{3/2}}$$

   Look it up in an integral table, or use Wolfram alpha.

2. Write down equation 22-10. For each term in this equation (dq, λ, ds), describe each term in words and give the units associated with it.

3. Write down equation 22-16.

   What does this equation describe? What regions or point(s) of space does it apply to? Write a few word description, and sketch what you mean.

   (Hint: It's not everywhere in space. Not sure? Look on the previous page.)