General Physics - E&M (PHY 1308) Lecture Notes

Quiz003

SteveSekula, 10 September 2010 (created 9 September 2010)

no tags

Name:_____

Date:_____

Rules for the Quiz:

- You are given **5 minutes at the beginning** to look over the quiz quietly and jot some notes on a 3x5-inch notecard. Use this time to think about how to attack the quiz problem(s)
- You are given **10 minutes in the middle** to discuss the quiz with your teammates. Use this time to develop strategies across the group for attacking the problem(s). You are allowed to keep notes from this discussion on the SAME 3x5-inch notecard.
- You then have **15 minutes at the end** to work individually (NO MORE DISCUSSION) to solve the problem(s). Use your notes on the 3x5-inch card to help you attack the problem(s)
- You are allowed to use a calculator
- Your grade will be determined from the weighted-average of your group and not from your individual performance. The highest grade will be weighted the most, and the lowest the least. Low grades will drag the average down, so it is in your best interest to collaborate during the discussion part of this quiz. All members of your team get the same grade, determined from that weighted average.

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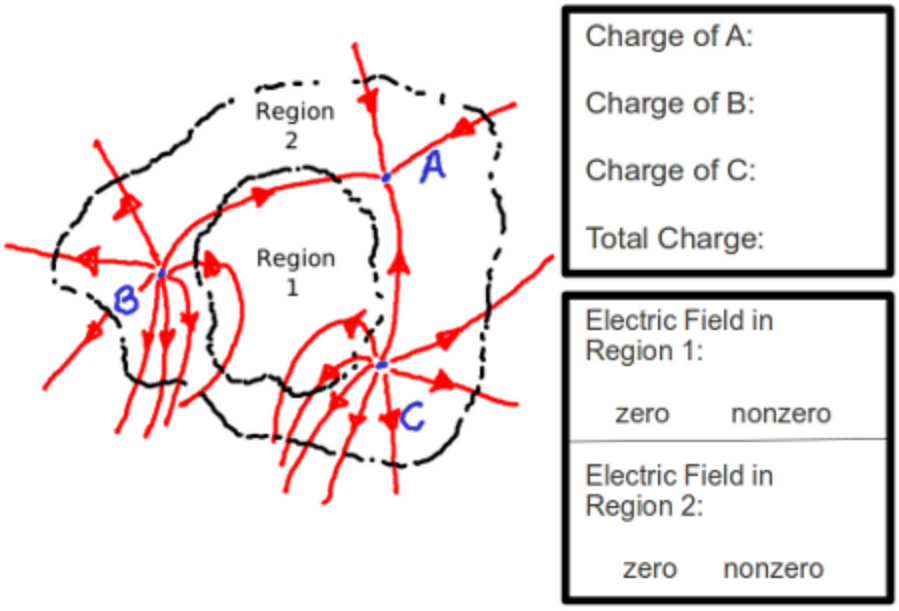
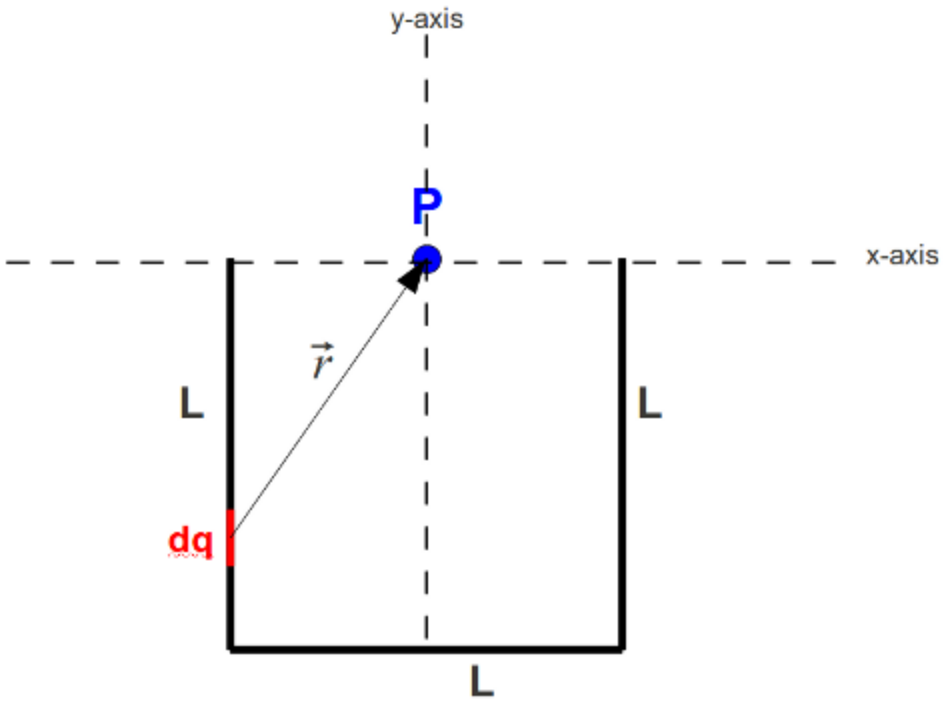
1. **(10 Points)** Consider the arrangement of charges shown below, in the graphical representation of electric charge and field lines.
   a. What are that charges of A, B, and C?
   b. What is the total charge?
   c. What does Gauss's Law predict for the total electric field in Region 1 and Region 2 (circle one of either *zero* or *nonzero*)? *Note: Region 2 includes Region 1 as well.*



1. **(20 Points)** Consider a system of three thin lines of charge, each of equal length L, arranged to form the 2-dimensional "cup" shown below. Each line carries a total charge Q distributed uniformly along its length. Using the electric field version of Coulomb's Law,

$$\vec{E} = \int \frac{k\,dq}{r^2}\hat{r},$$

setup - BUT DO NOT ACTUALLY INTEGRATE - the integral that represents the electric field at point P in the drawing below (located at the point $(x, y) = (0, L)$). This means that you need to determine dq, r, and $\hat{r}$ as they relate to the geometry of this problem - that is, only in terms of either constants in the problem or geometric quantities (with defined limits of integration) over which you can integrate, but DO NOT ACTUALLY PERFORM THE FINAL INTEGRATION. *HINT: break the problem into pieces, including the integral itself.*


y-axis
P
x-axis
$\vec{r}$
L
L
dq
L