PHYS102 - Electric Fields

Dr. Suess

January 26, 2007

Question #1

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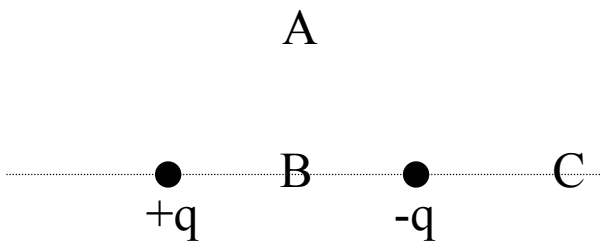

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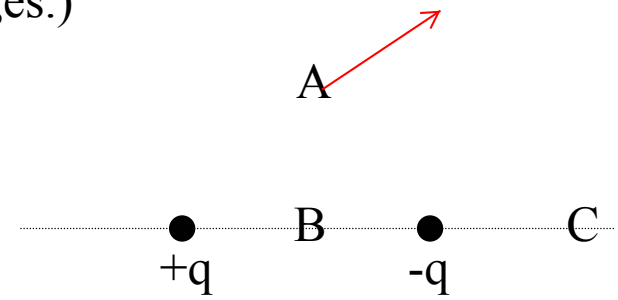

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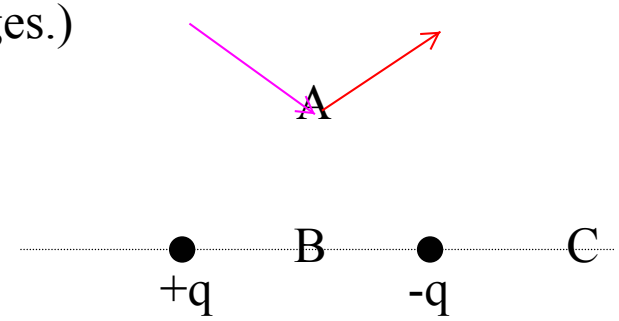

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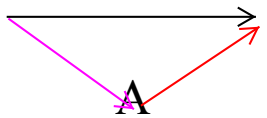

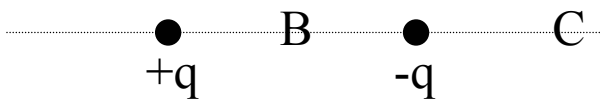

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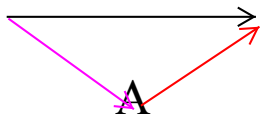

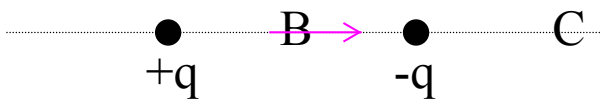

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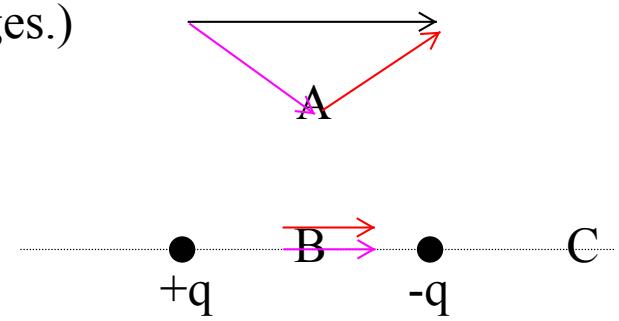

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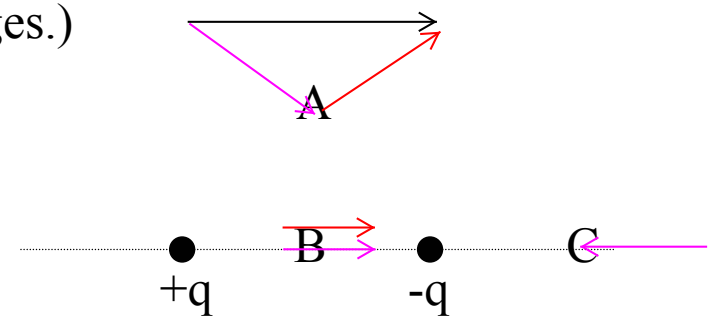

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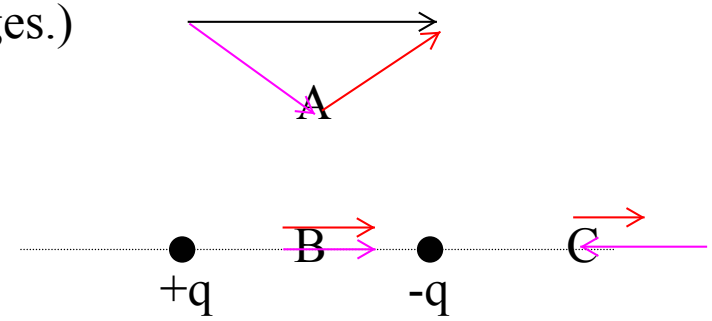

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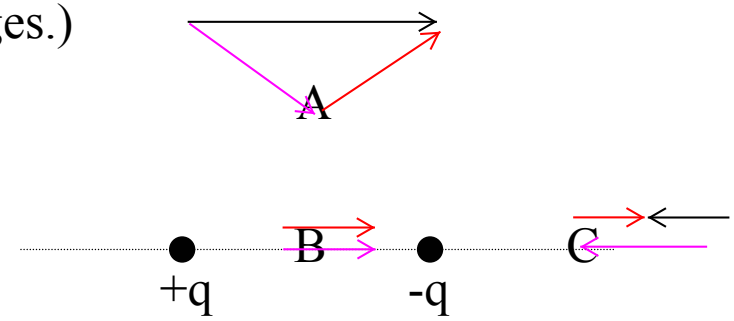

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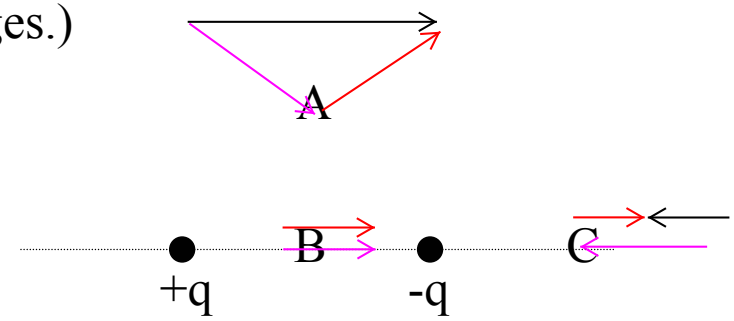

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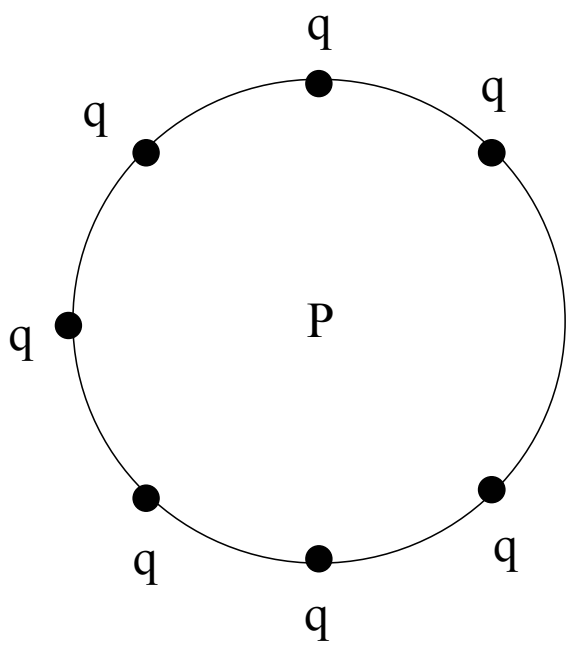

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1. 0
2. $(1/8)\ (kq/R^2)$
3. $(7/8)\ (kq/R^2)$
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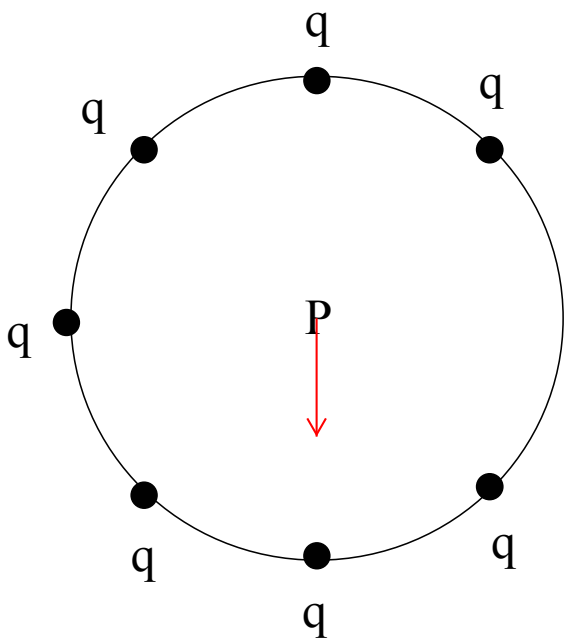

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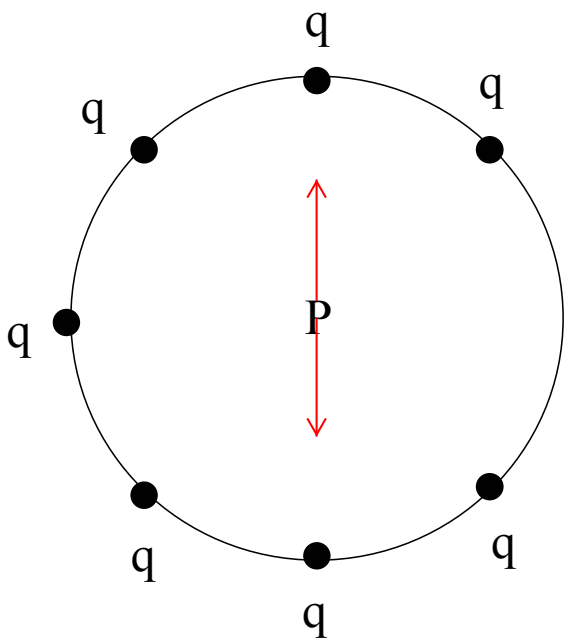

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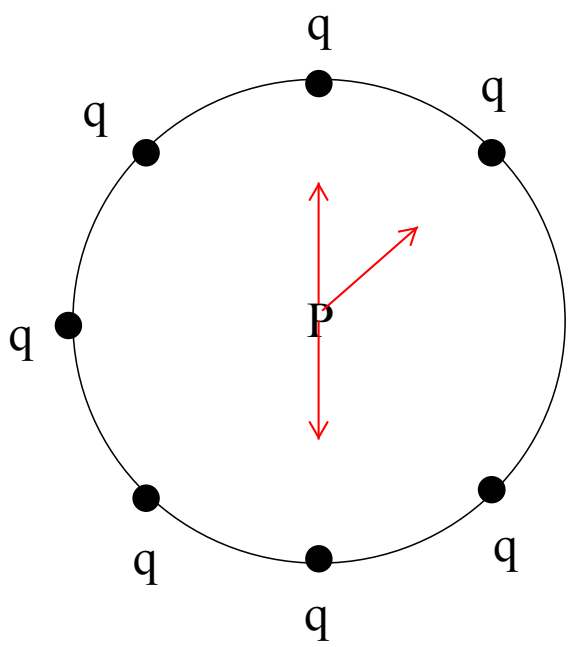

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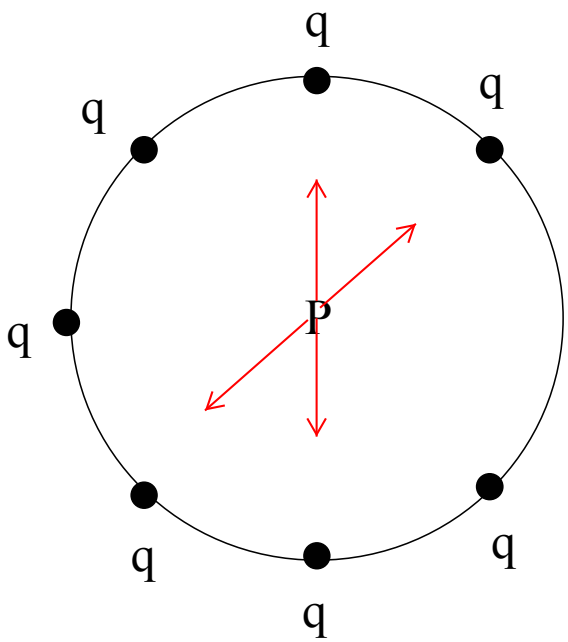

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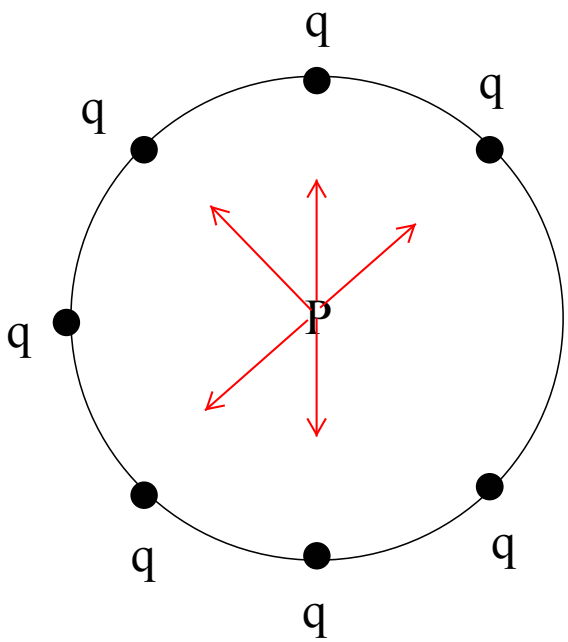

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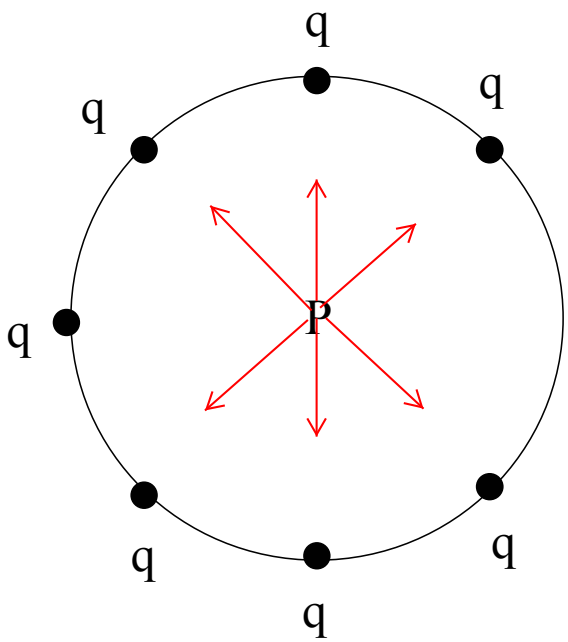

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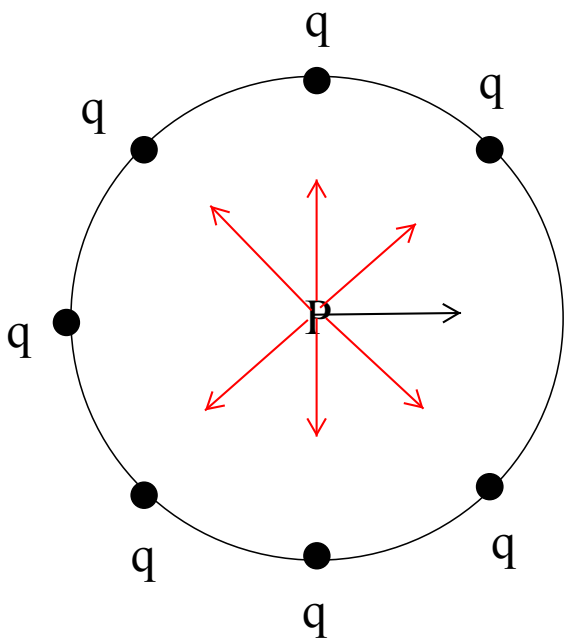

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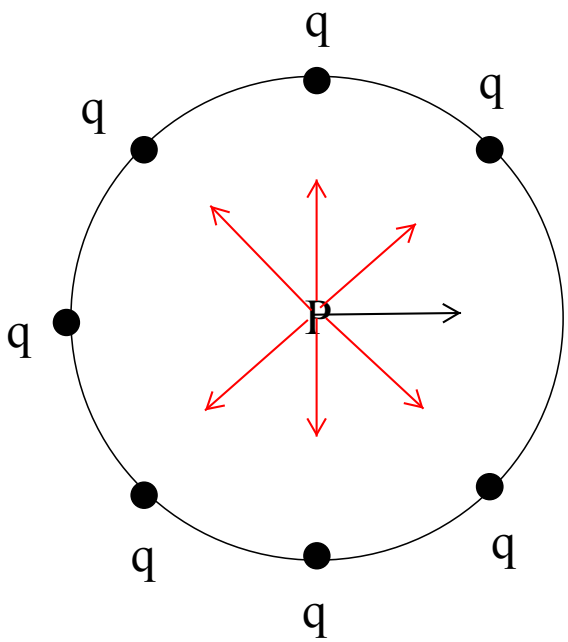

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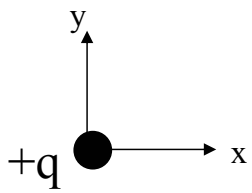
For the assembly of charge(s) shown below, which graph depicts the values of E_x for points along the x-axis?



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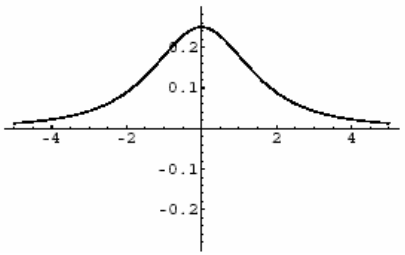

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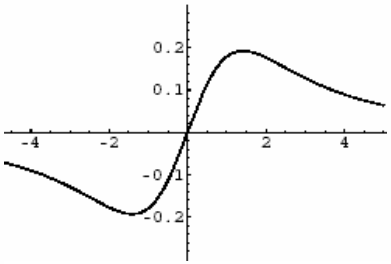

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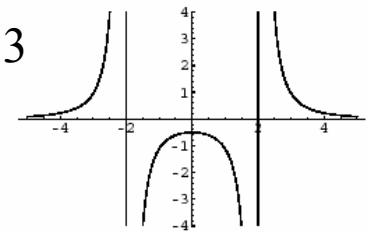

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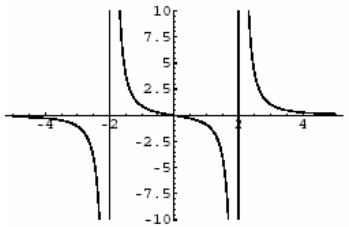

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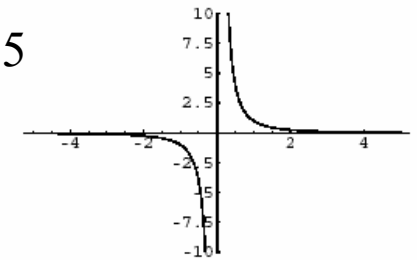

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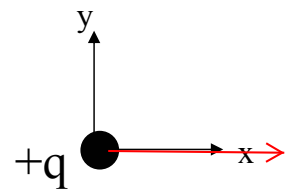
For the assembly of charge(s) shown below, which graph depicts the values of E_x for points along the x-axis?



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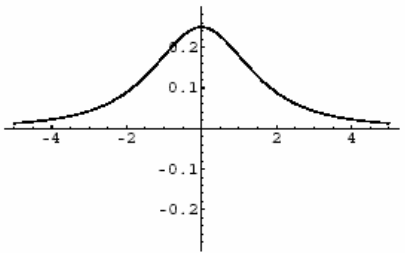

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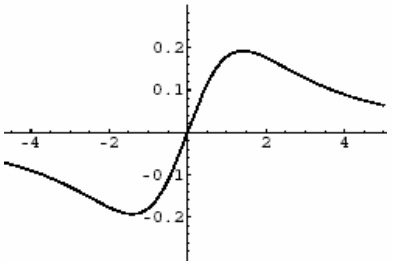

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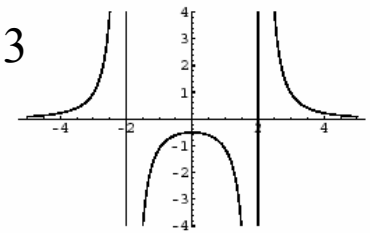

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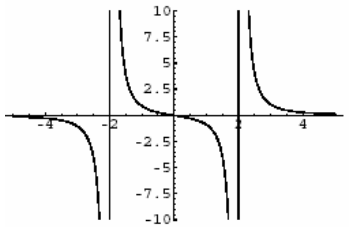

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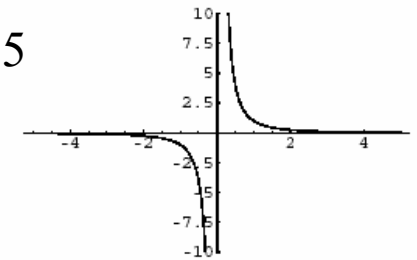

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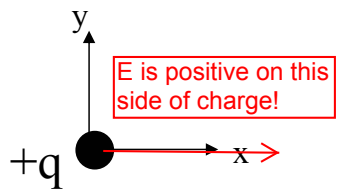
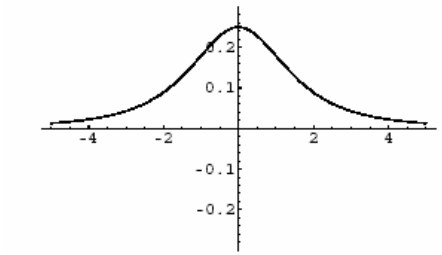
For the assembly of charge(s) shown below, which graph depicts the values of E_x for points along the x-axis?



1



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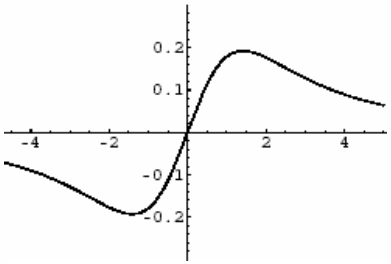

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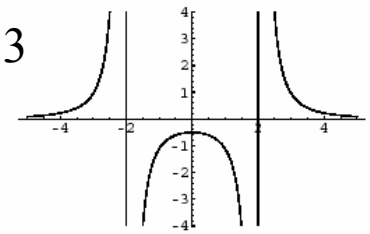

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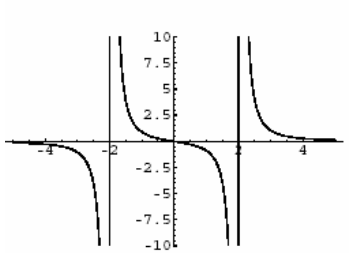

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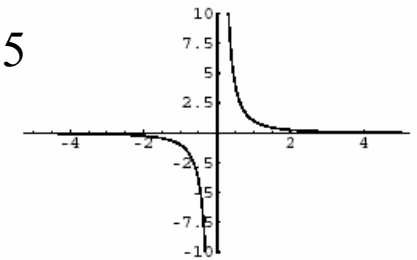
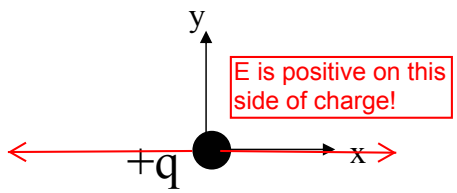


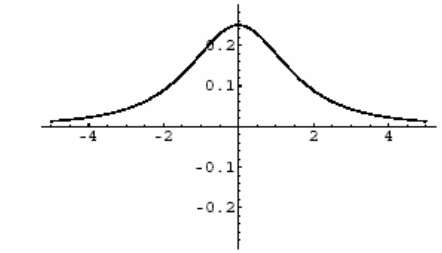
Question #3

PRS Questions
- Question #1
- Question #2
- Question #3
- Question #4
- Question #5
- Question #6
- Question #7
- Dipole Moments and Electric Fields
- Question #8
- Question #9

For the assembly of charge(s) shown below, which graph depicts the values of E_x for points along the x-axis?



1



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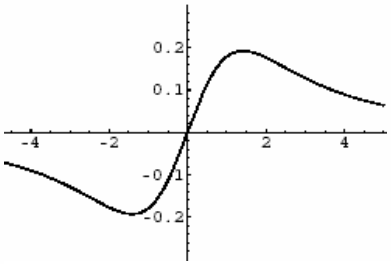

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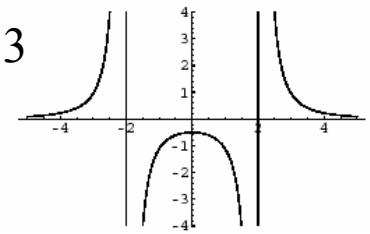

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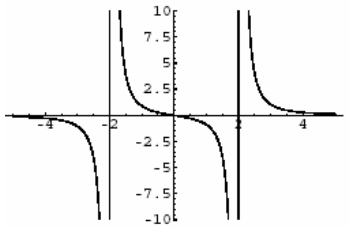

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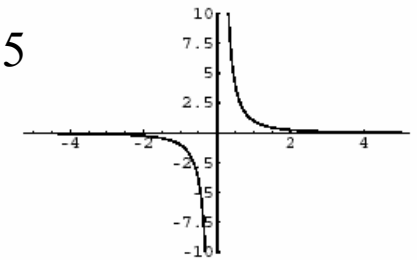
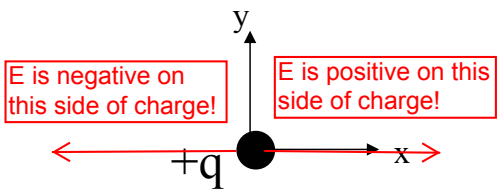


Question #3

PRS Questions
- Question #1
- Question #2
- Question #3
- Question #4
- Question #5
- Question #6
- Question #7
- Dipole Moments and Electric Fields
- Question #8
- Question #9

For the assembly of charge(s) shown below, which graph depicts the values of E_x for points along the x-axis?



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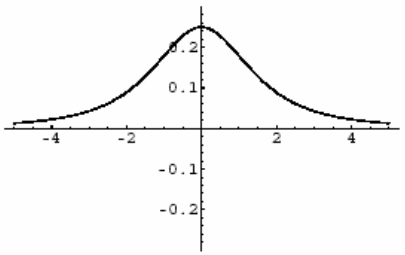

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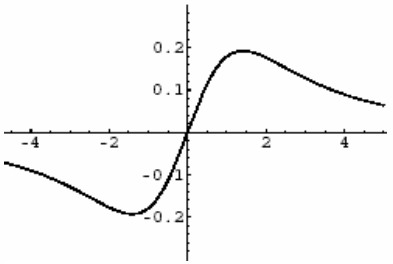
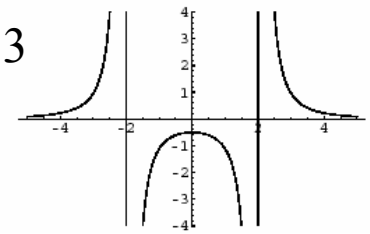


3



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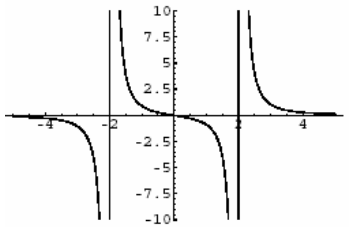

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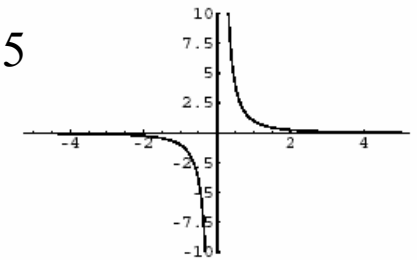
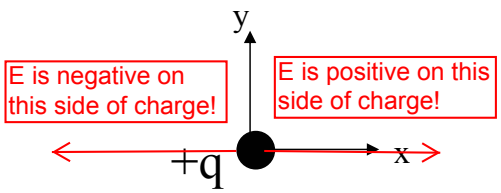


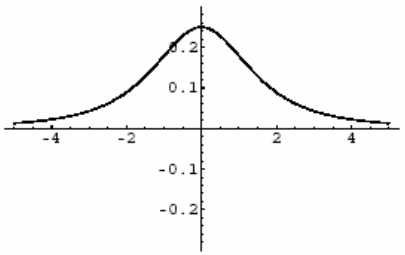
Question #3

PRS Questions
- Question #1
- Question #2
- Question #3
- Question #4
- Question #5
- Question #6
- Question #7
- Dipole Moments and Electric Fields
- Question #8
- Question #9

For the assembly of charge(s) shown below, which graph depicts the values of E_x for points along the x-axis?



1



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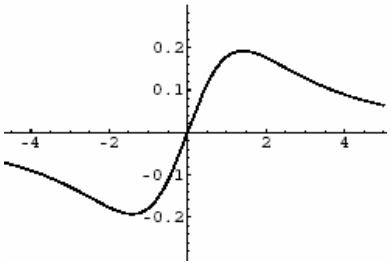

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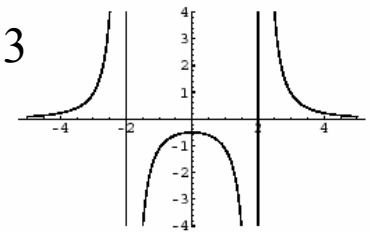
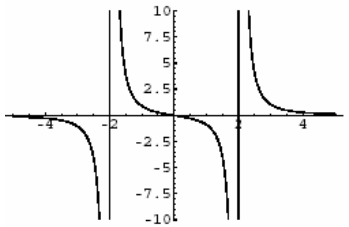
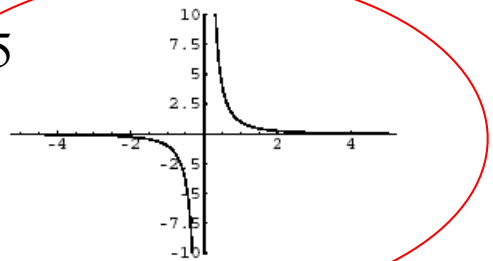


4



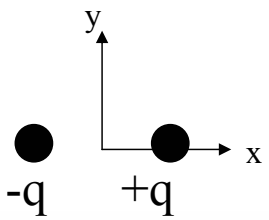
5



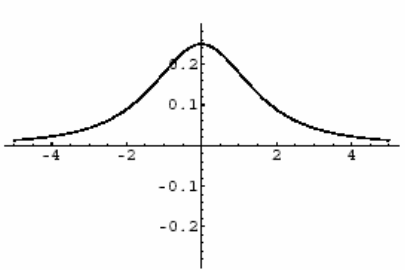
Question #4

PRS Questions
- Question #1
- Question #2
- Question #3
- Question #4
- Question #5
- Question #6
- Question #7
- Dipole Moments and Electric Fields
- Question #8
- Question #9

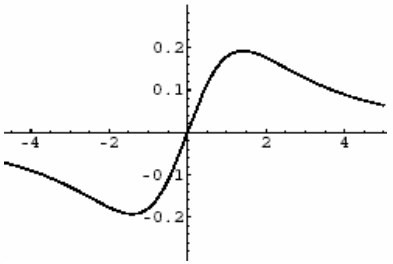
For the assembly of charge(s) shown below, which graph depicts the values of E_x for points along the x-axis?



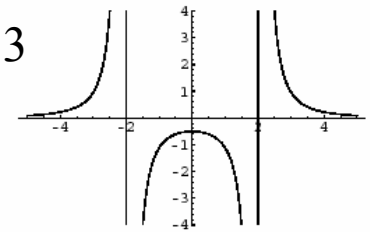
1



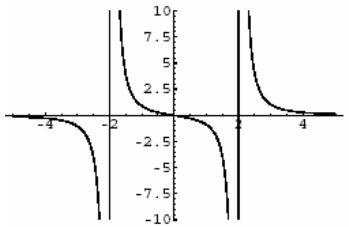
2



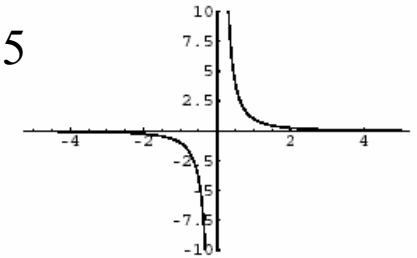
3



4



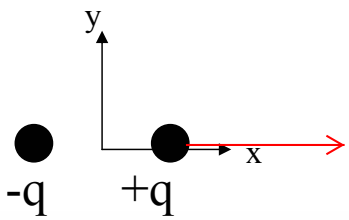
5



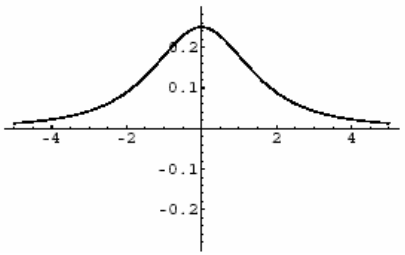
Question #4

PRS Questions
- Question #1
- Question #2
- Question #3
- Question #4
- Question #5
- Question #6
- Question #7
- Dipole Moments and Electric Fields
- Question #8
- Question #9

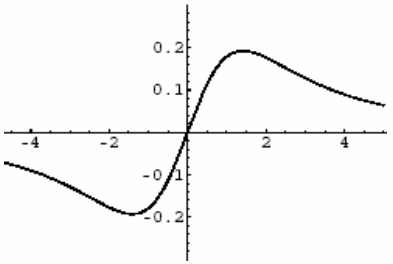
For the assembly of charge(s) shown below, which graph depicts the values of E_x for points along the x-axis?



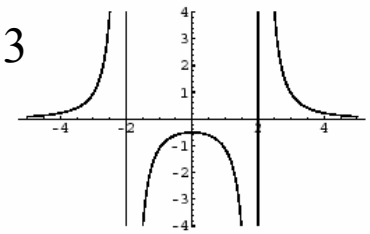
1



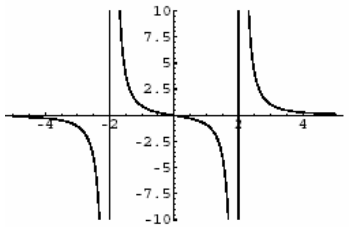
2



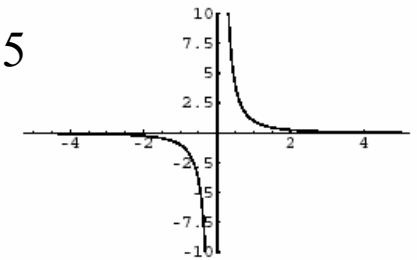
3



4



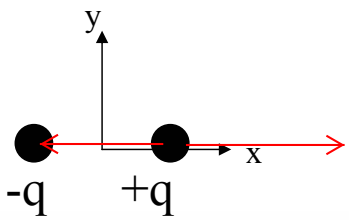
5



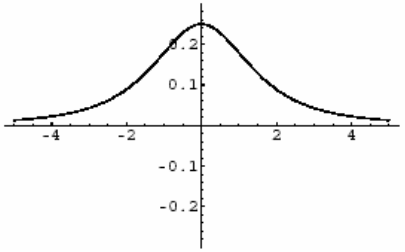
Question #4

PRS Questions
- Question #1
- Question #2
- Question #3
- Question #4
- Question #5
- Question #6
- Question #7
- Dipole Moments and Electric Fields
- Question #8
- Question #9

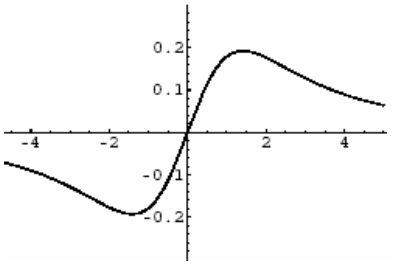
For the assembly of charge(s) shown below, which graph depicts the values of E_x for points along the x-axis?



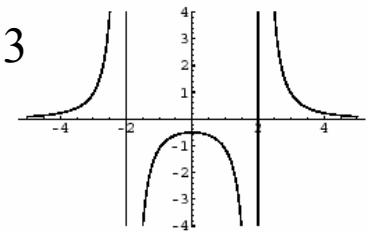
1



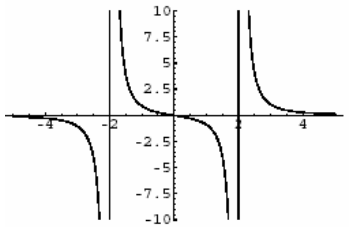
2



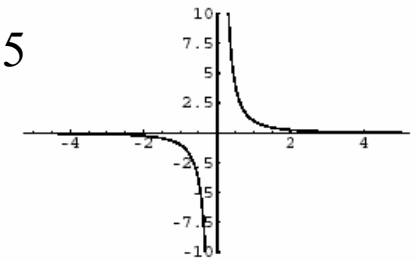
3



4



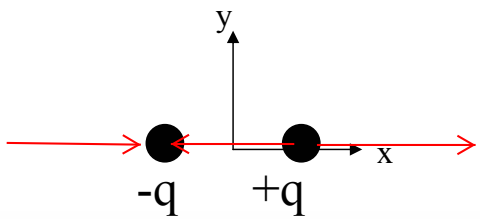
5



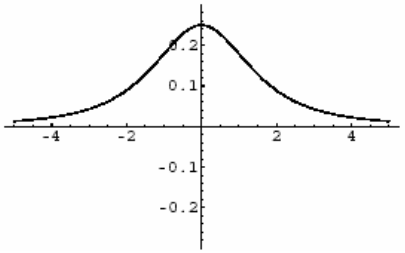
Question #4

PRS Questions
- Question #1
- Question #2
- Question #3
- Question #4
- Question #5
- Question #6
- Question #7
- Dipole Moments and Electric Fields
- Question #8
- Question #9

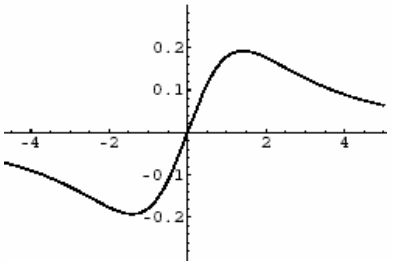
For the assembly of charge(s) shown below, which graph depicts the values of E_x for points along the x-axis?



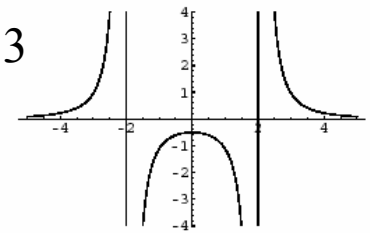
1



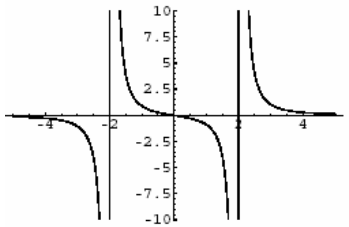
2



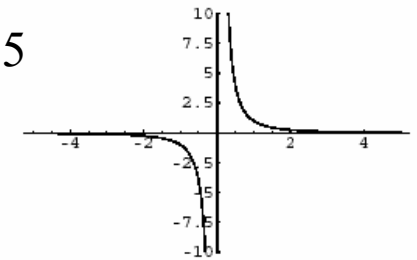
3



4



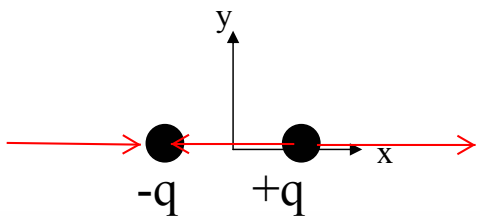
5



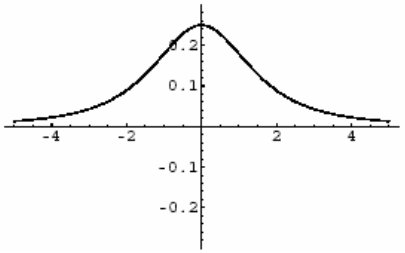
Question #4

PRS Questions
- Question #1
- Question #2
- Question #3
- Question #4
- Question #5
- Question #6
- Question #7
- Dipole Moments and Electric Fields
- Question #8
- Question #9

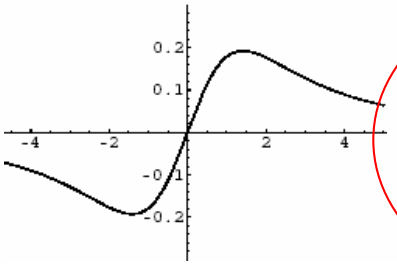
For the assembly of charge(s) shown below, which graph depicts the values of E_x for points along the x-axis?



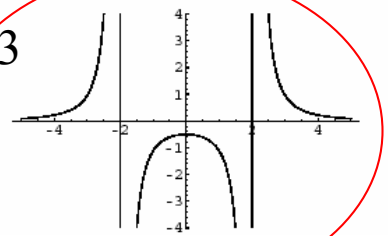
1



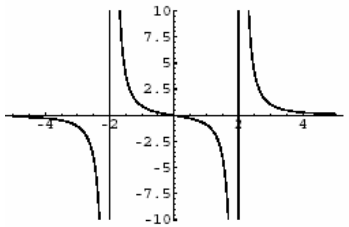
2



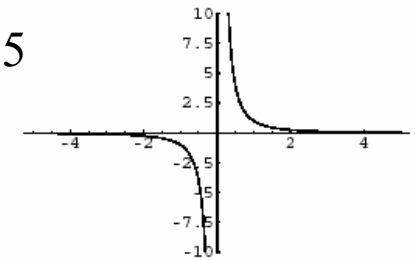
3



4



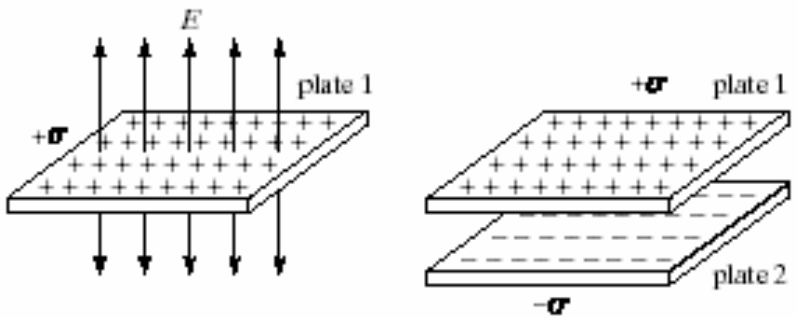
5



Question #5

PRS Questions
- Question #1
- Question #2
- Question #3
- Question #4
- Question #5
- Question #6
- Question #7
- Dipole Moments and Electric Fields
- Question #8
- Question #9

The electric charge per unit area is $+\sigma$ for plate 1, a very large insulating sheet, and $-\sigma$ for plate 2, another very large insulating sheet. When the two are placed parallel to one another, the magnitude of the electric field in the central region of the plates is approximately



1. σ/ε_o between, 0 outside.
2. σ/ε_o between, $\pm\ \sigma/2\varepsilon_o$ outside.
3. zero both between and outside.
4. $\pm\sigma/2\varepsilon_o$ both between and outside.
5. none of the above

Question #5

PRS Questions
- Question #1
- Question #2
- Question #3
- Question #4
- Question #5
- Question #6
- Question #7
- Dipole Moments and Electric Fields
- Question #8
- Question #9

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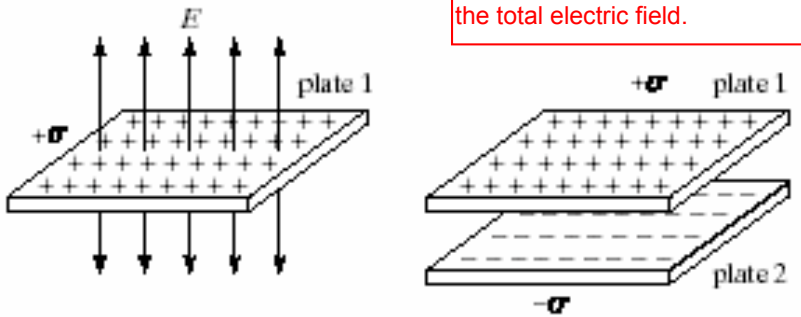
One plate sets up an electric field of magnitude sigma/(2epsilon_0). Add the electric field (vector) to find the total electric field.

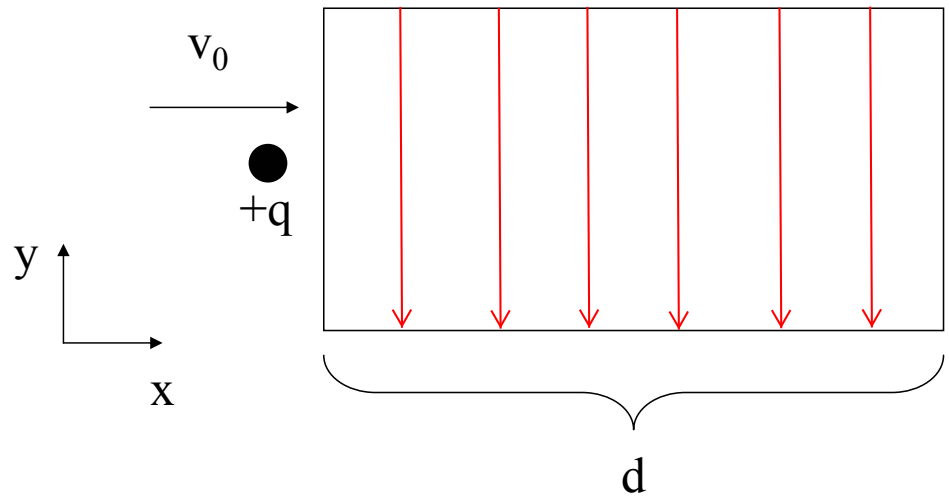


1. σ/ε_o between, 0 outside.
2. σ/ε_o between, $\pm\ \sigma/2\varepsilon_o$ outside.
3. zero both between and outside.
4. $\pm\sigma/2\varepsilon_o$ both between and outside.
5. none of the above

Question #6

PRS Questions
- Question #1
- Question #2
- Question #3
- Question #4
- Question #5
- Question #6
- Question #7
- Dipole Moments and Electric Fields
- Question #8
- Question #9

A particle with charge $+q$, mass m and initial speed v_0 in the + x direction enters a region where the electric field is constant in the –y direction with magnitude E. How much time does it take for the particle to cross the region of length d?



1. $t < d/v_0$
2. $t = d/v_0$
3. $t > d/v_0$
4. not enough information

Question #6

PRS Questions
- Question #1
- Question #2
- Question #3
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- Question #9

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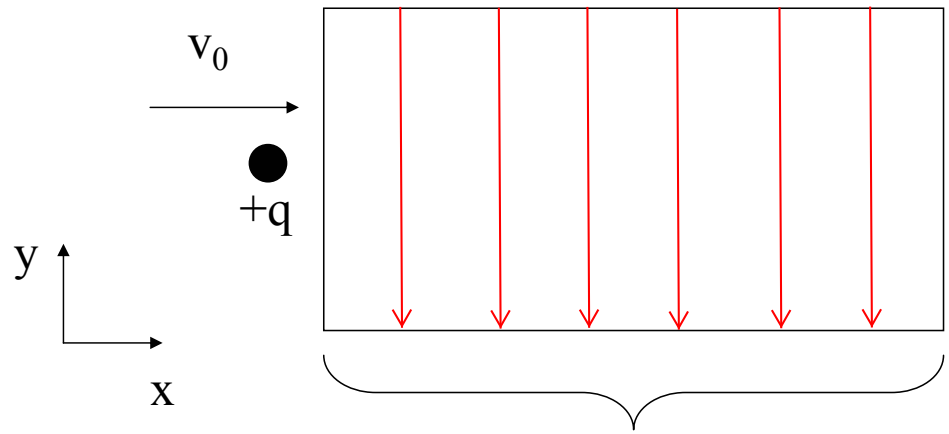

1. $t < d/v_0$
2. $t = d/v_0$
3. $t > d/v_0$
4. not enough information

The only forces acting on the +q particle is the electric force (due to the external electric field) acting in the -y direction and the force due to gravity also acting along the -y direction.

Newton's 2nd law implies that the component of velocity in the x direction remains constant (i.e., no acceleration in the x direction).

The y component of acceleration is not zero. The y-component of acceleration is constant if E is constant so think kinematics!

Question #6

PRS Questions
- Question #1
- Question #2
- Question #3
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- Question #8
- Question #9

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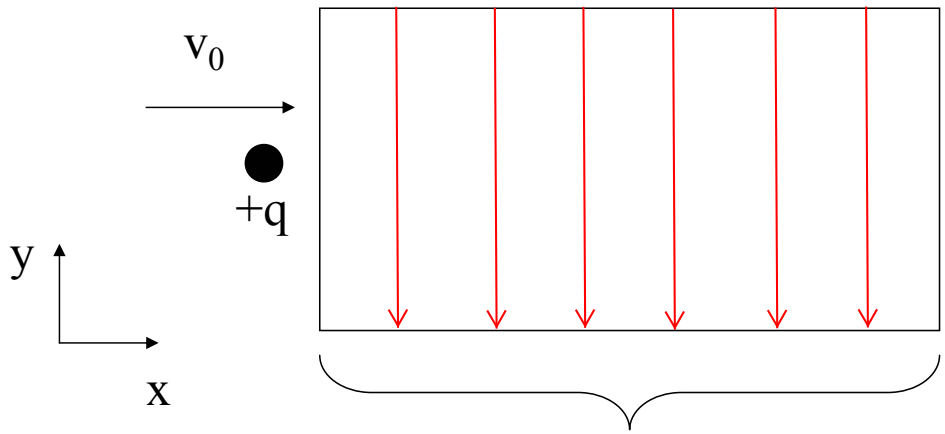

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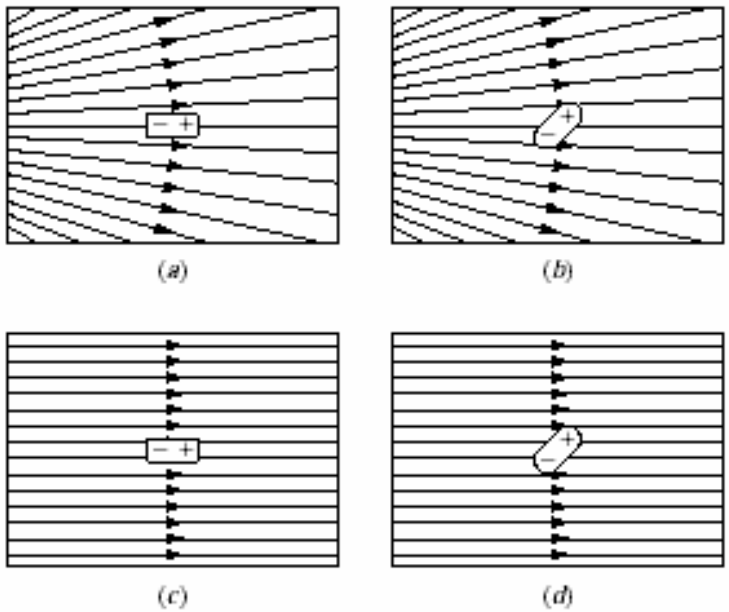
Question #7

PRS Questions
- Question #1
- Question #2
- Question #3
- Question #4
- Question #5
- Question #6
- Question #7
- Dipole Moments and Electric Fields
- Question #8
- Question #9

An electrically neutral dipole is placed in an external field. In which situation(s) is the net force on the dipole zero?



1. (a)
2. (c)
3. (b) and (d)
4. (a) and (c)
5. (c) and (d)
6. some other combination
7. none of the above

Question #7

PRS Questions
- Question #1
- Question #2
- Question #3
- Question #4
- Question #5
- Question #6
- Question #7
- Dipole Moments and Electric Fields
- Question #8
- Question #9

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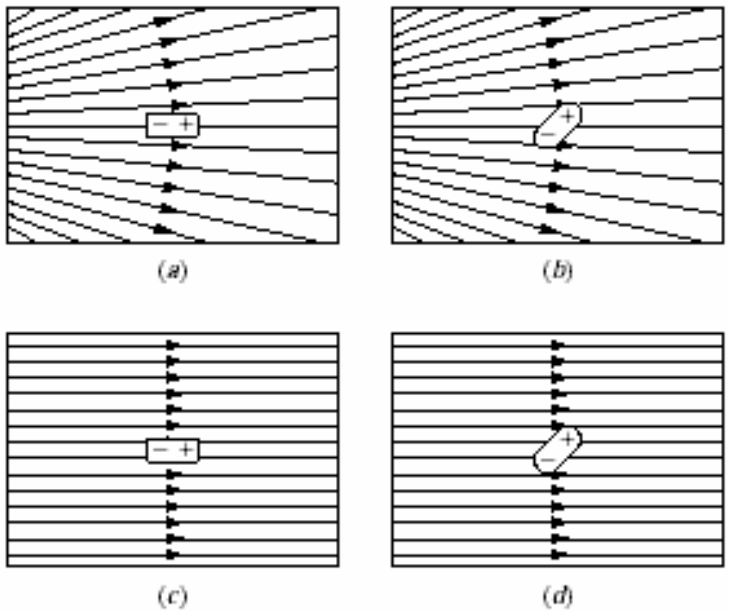

1. (*a*)
2. (*c*)
3. (*b*) and (*d*)
4. (*a*) and (*c*)
5. (*c*) and (*d*)
6. some other combination
7. none of the above

Dipole Moments and Electric Fields

PRS Questions
- Question #1
- Question #2
- Question #3
- Question #4
- Question #5
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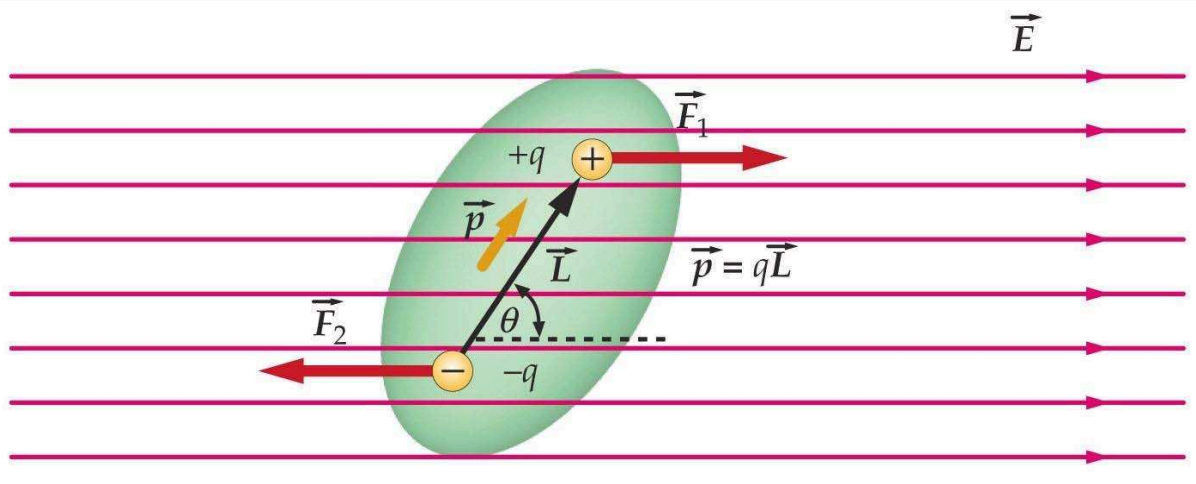
- Question #7
- Dipole Moments and Electric Fields
- Question #8
- Question #9



Since a dipole consists of equal amounts of positive and negative charge, the net force on the dipole is zero in a **uniform** electric field. The forces are along different lines of action which produce a torque.

$$\vec{\tau}_- = \vec{\mathbf{L}} \times \vec{\mathbf{F}}_1$$

$$\vec{\tau}_- = \vec{\mathbf{p}} \times \vec{\mathbf{E}}$$