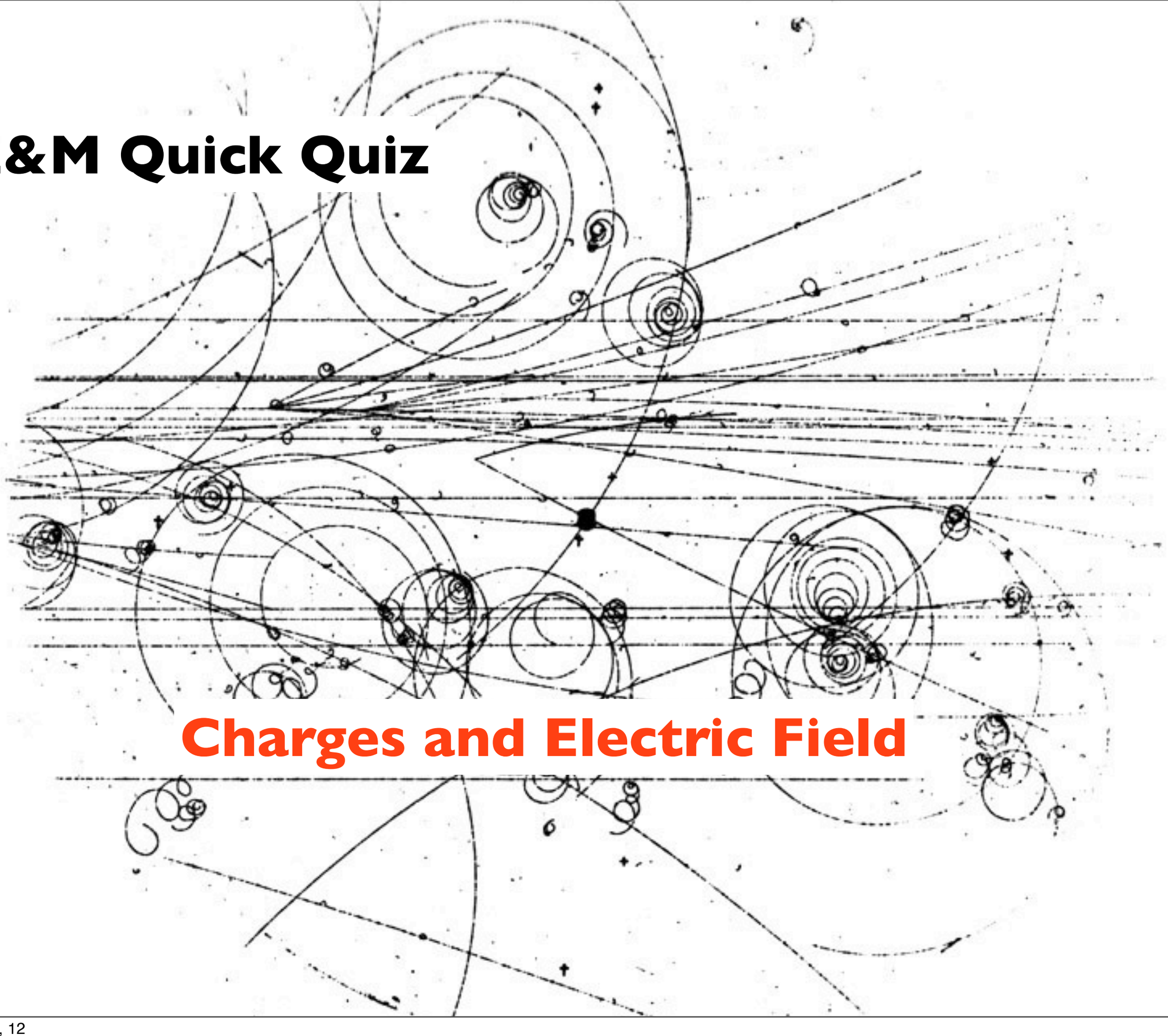
E&M Quick Quiz



Charges and Electric Field

A positively-charged piece of plastic exerts an attractive force on an electrically neutral piece of paper. This is because

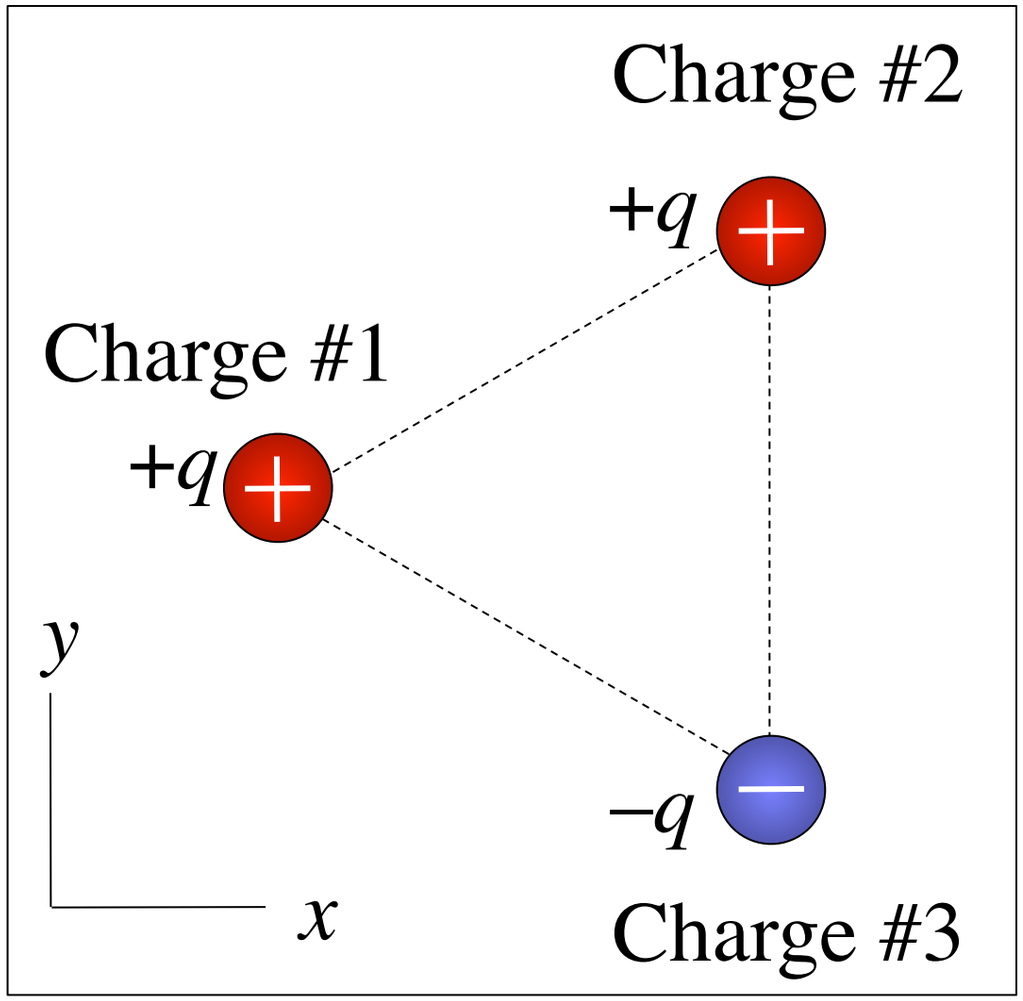
A. electrons are less massive than atomic nuclei.

B. the electric force between charged particles decreases with increasing distance.

C. an atomic nucleus occupies only a small part of the volume of an atom.

D. a typical atom has many electrons but only one nucleus.

Three point charges lie at the vertices of an equilateral triangle as shown. All three charges have the same magnitude, but Charges #1 and #2 are positive (+q) and Charge #3 is negative (–q).



The net electric force that Charges #2 and #3 exert on Charge #1 is in

A. the +x-direction.

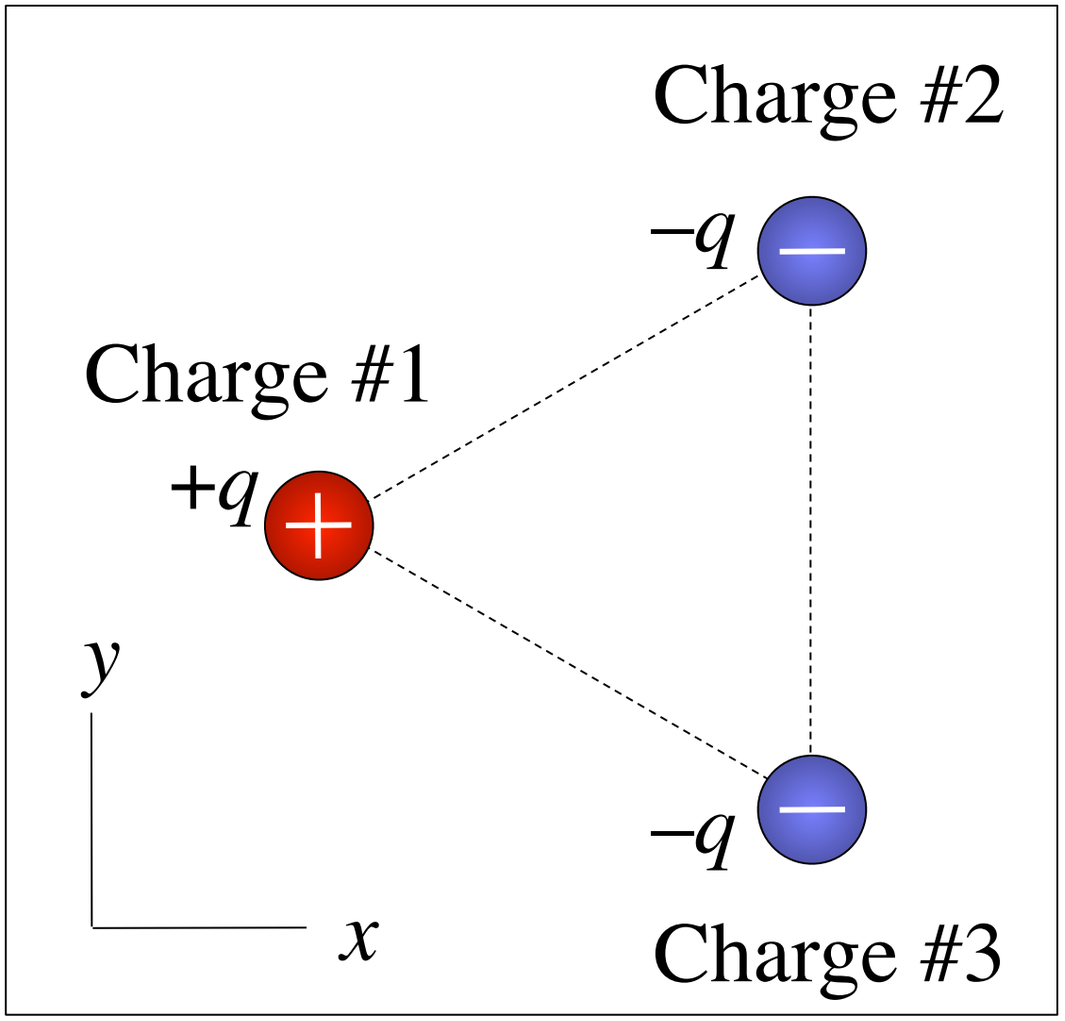
B. the –x-direction.

C. the +y-direction.

D. the –y-direction.

E. none of the above

Three point charges lie at the vertices of an equilateral triangle as shown. All three charges have the same magnitude, but Charge #1 is positive (+q) and Charges #2 and #3 are negative (–q).



The net electric force that Charges #2 and #3 exert on Charge #1 is in

A. the +x-direction.

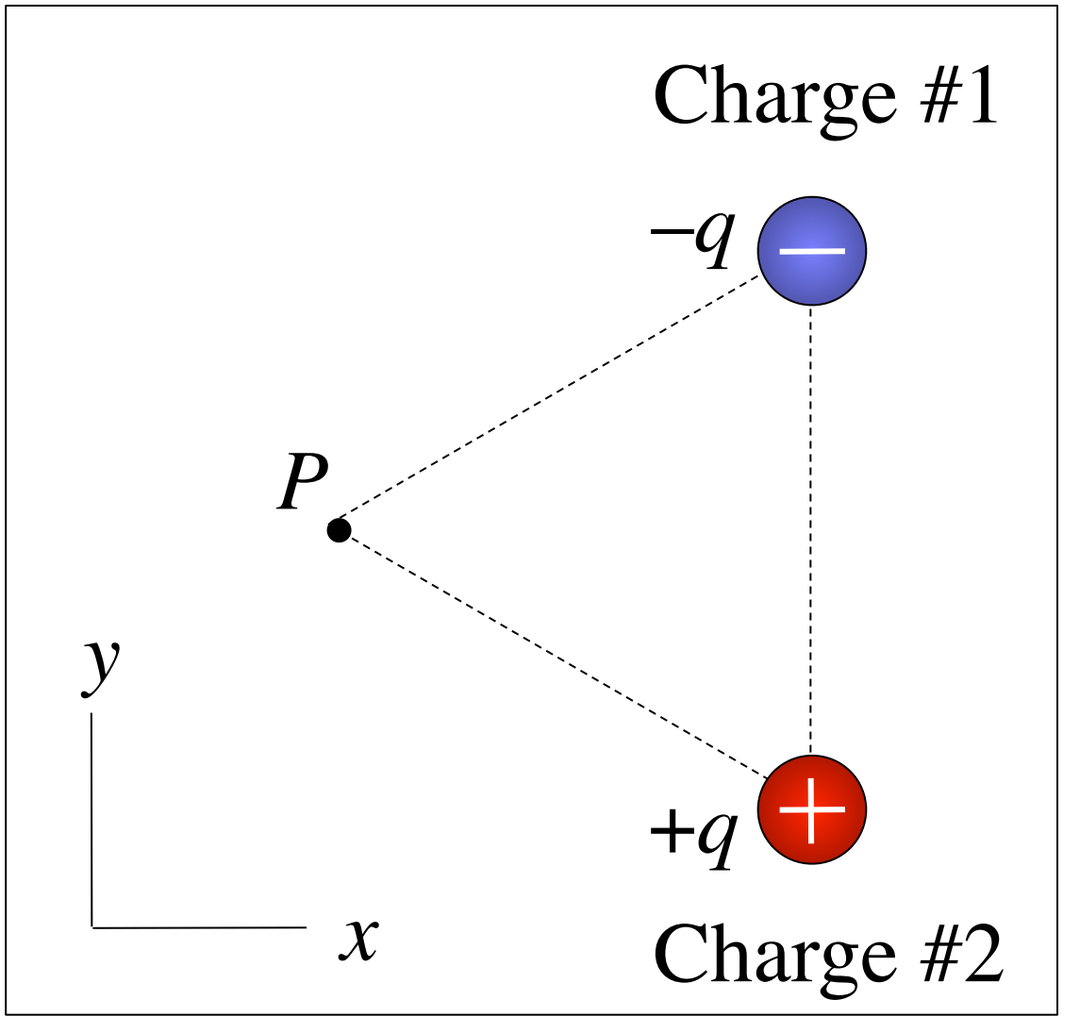
B. the –x-direction.

C. the +y-direction.

D. the –y-direction.

E. none of the above

Two point charges and a point P lie at the vertices of an equilateral triangle as shown. Both point charges have the same magnitude q but opposite signs. There is nothing at point P.



The net electric field that Charges #1 and #2 produce at point P is in

A. the +x-direction.

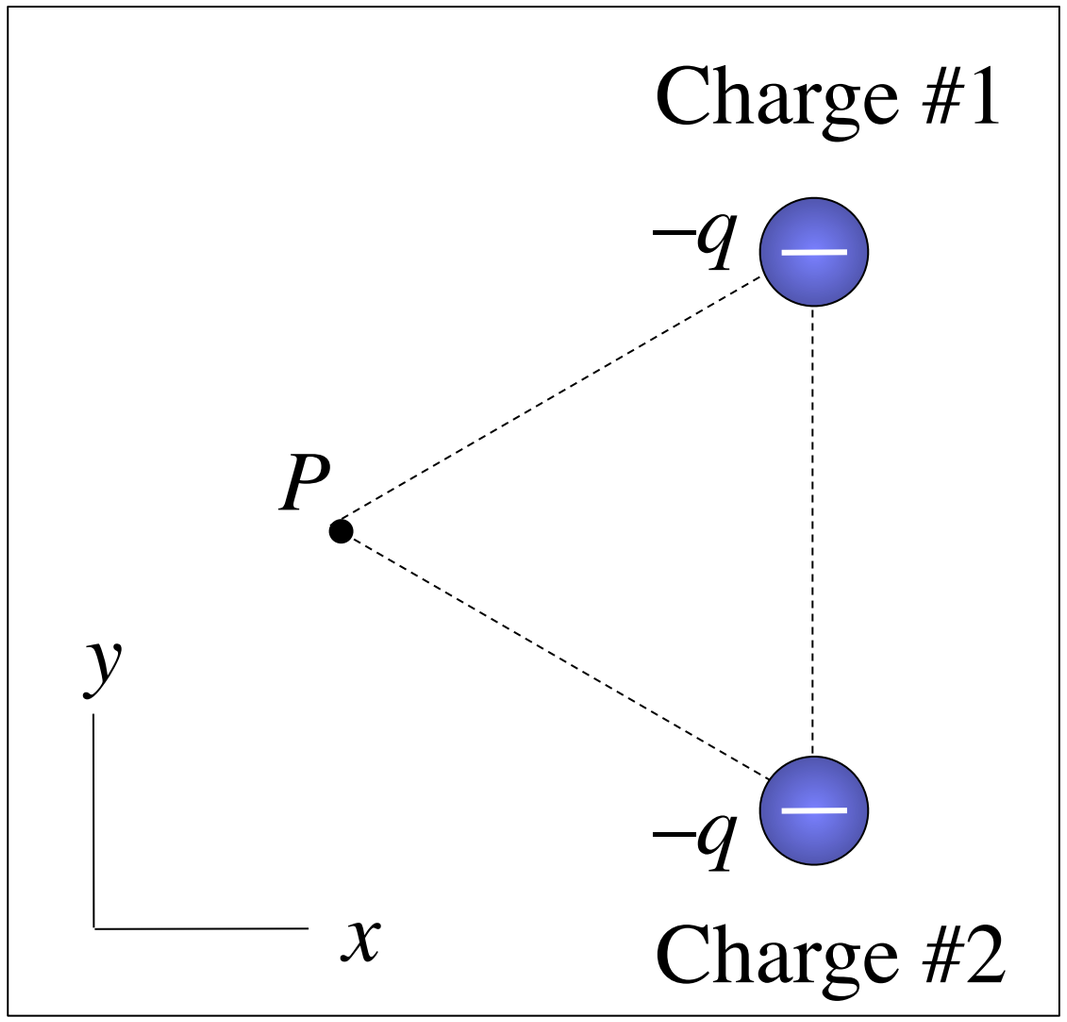
B. the –x-direction.

C. the +y-direction.

D. the –y-direction.

E. none of the above

Two point charges and a point P lie at the vertices of an equilateral triangle as shown. Both point charges have the same negative charge ($-q$). There is nothing at point P.



The net electric field that Charges #1 and #2 produce at point P is in

A. the $+x$-direction.

B. the $-x$-direction.

C. the $+y$-direction.

D. the $-y$-direction.

E. none of the above

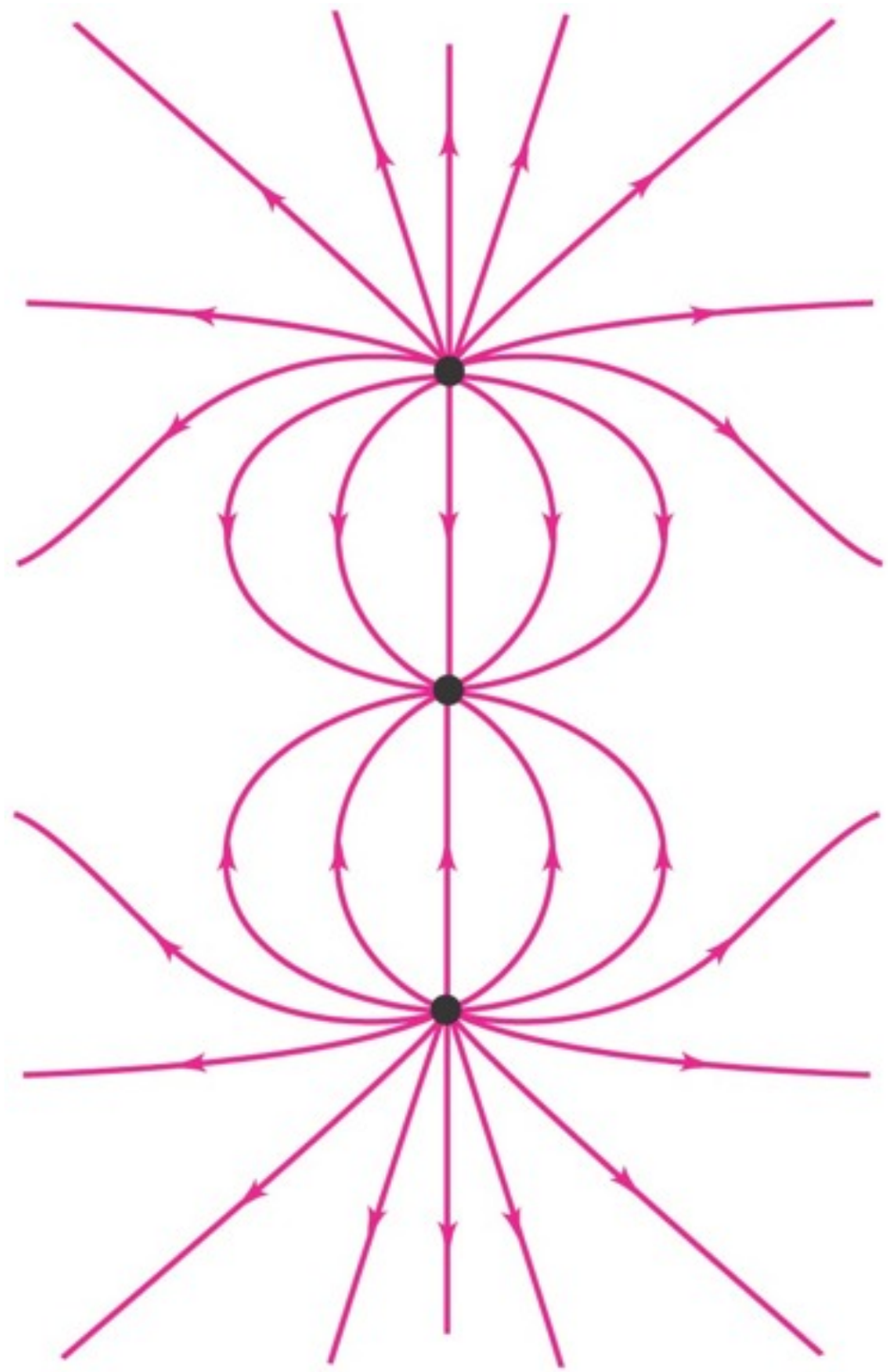
The illustration shows the electric field lines due to three point charges. The electric field is strongest

A. where the field lines are closest together.

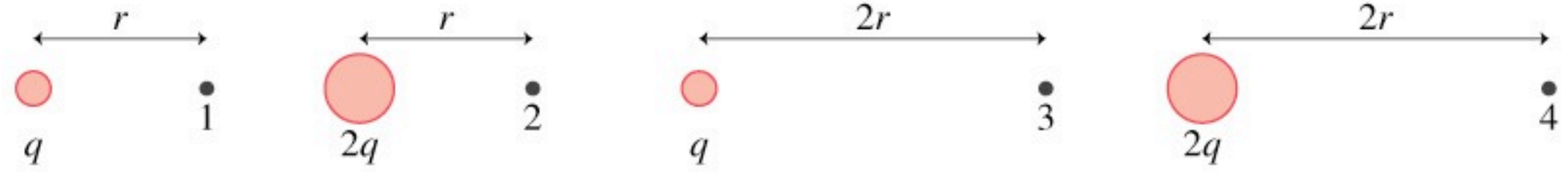
B. where the field lines are farthest apart.

C. where adjacent field lines are parallel.

D. none of the above



Rank in order, from largest to smallest, the electric field strengths E_1 to E_4 at points 1 to 4.



A. $E_2 > E_4 > E_1 > E_3$

B. $E_1 = E_2 > E_3 = E_4$

C. $E_2 > E_1 = E_4 > E_3$

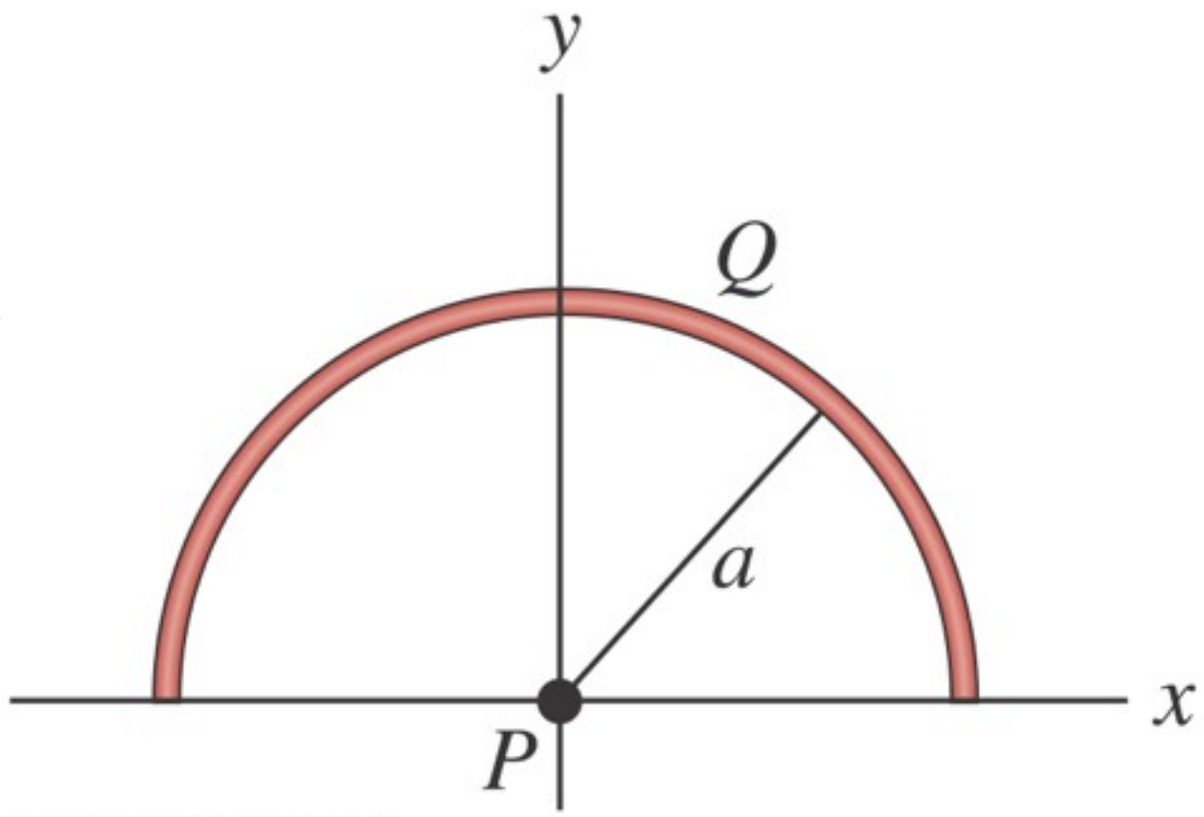
D. $E_2 > E_1 > E_4 > E_3$

E. $E_1 > E_2 > E_3 > E_4$

At the position of the dot, the electric field points

A. Up.
B. Down.
C. Left.
D. Right.
E. The electric field is zero.

Positive charge is uniformly distributed around a semicircle. The electric field that this charge produces at the center of curvature *P* is in



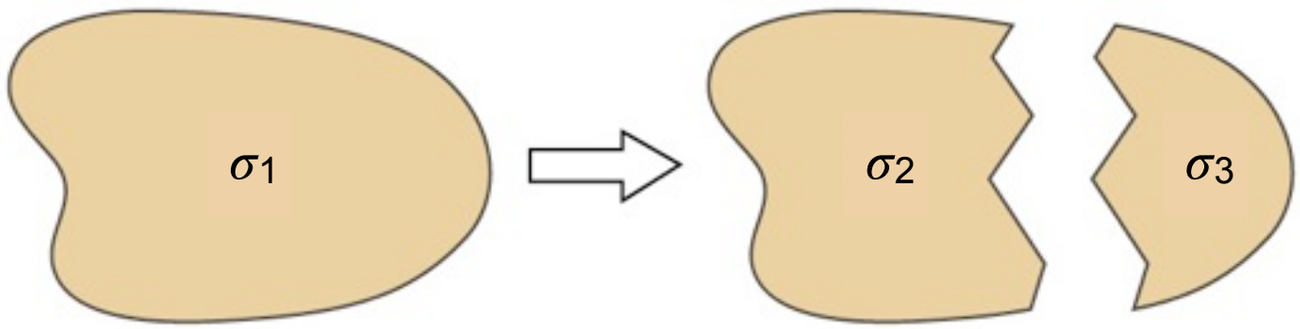
A. the +*x*-direction.

B. the –*x*-direction.

C. the +*y*-direction.

D. the –*y*-direction.

E. none of the above



A piece of plastic is uniformly charged with surface charge density σ_1. The plastic is then broken into a large piece with surface charge density σ_2 and a small piece with surface charge density σ_3. Rank in order, from largest to smallest, the surface charge densities σ_1 to σ_3.

A. $\sigma_2 = \sigma_3 > \sigma_1$
B. $\sigma_1 > \sigma_2 > \sigma_3$
C. $\sigma_1 > \sigma_2 = \sigma_3$
D. $\sigma_3 > \sigma_2 > \sigma_1$
E. $\sigma_1 = \sigma_2 = \sigma_3$

Three point charges lie at the vertices of an equilateral triangle as shown. Charges #2 and #3 make up an electric dipole.

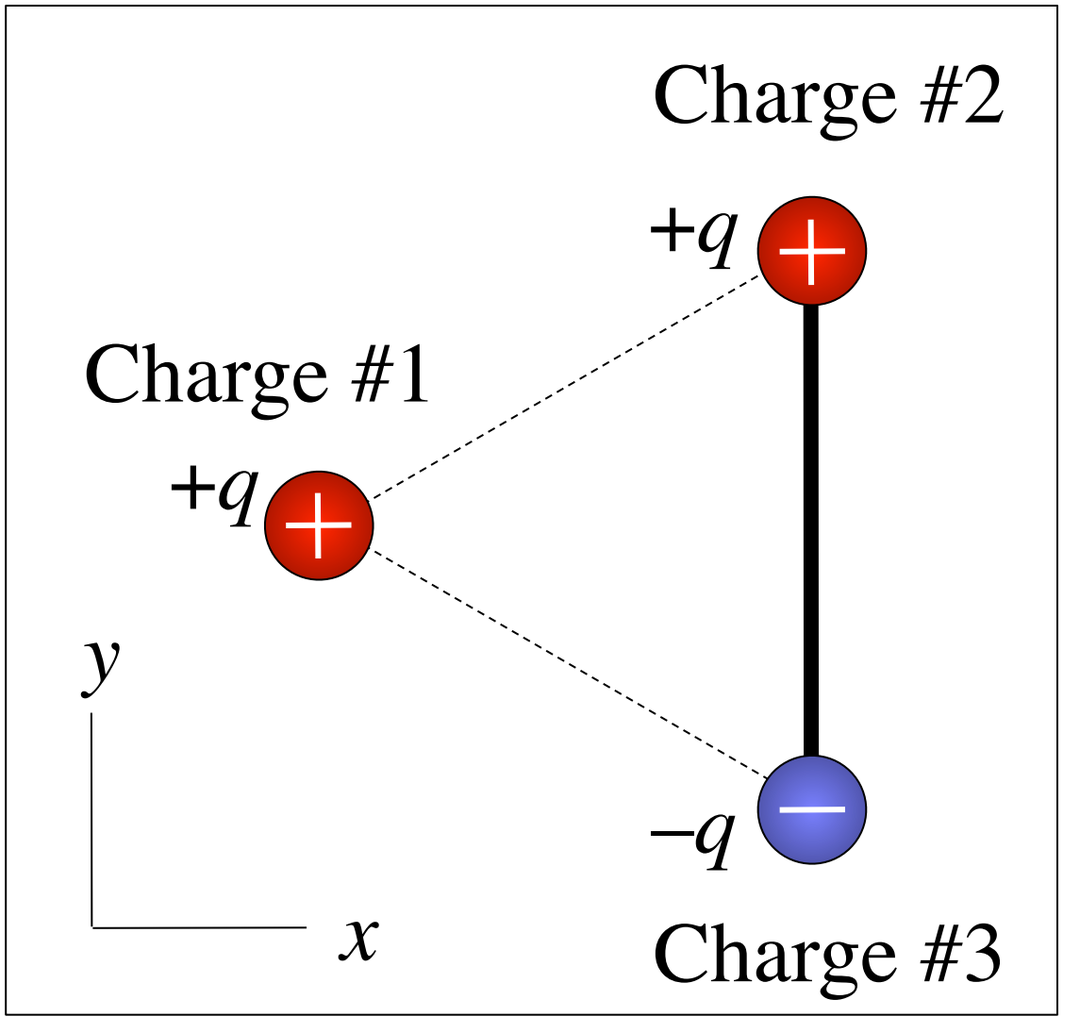
The net electric *torque* that Charge #1 exerts on the dipole is

A. clockwise.

B. counterclockwise.

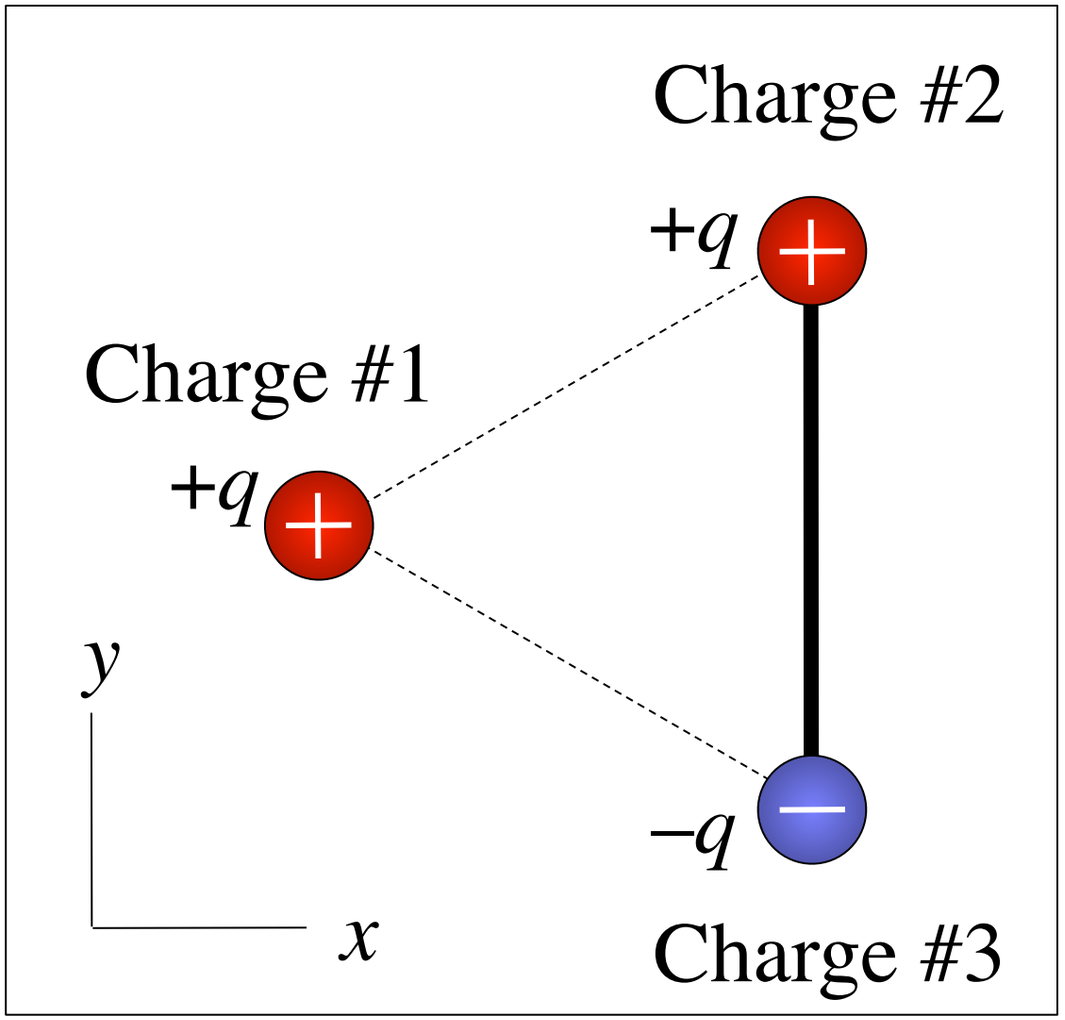
C. zero.

D. not enough information given to decide



Three point charges lie at the vertices of an equilateral triangle as shown. Charges #2 and #3 make up an electric dipole.

The net electric *force* that Charge #1 exerts on the dipole is in



A. the +*x*-direction.

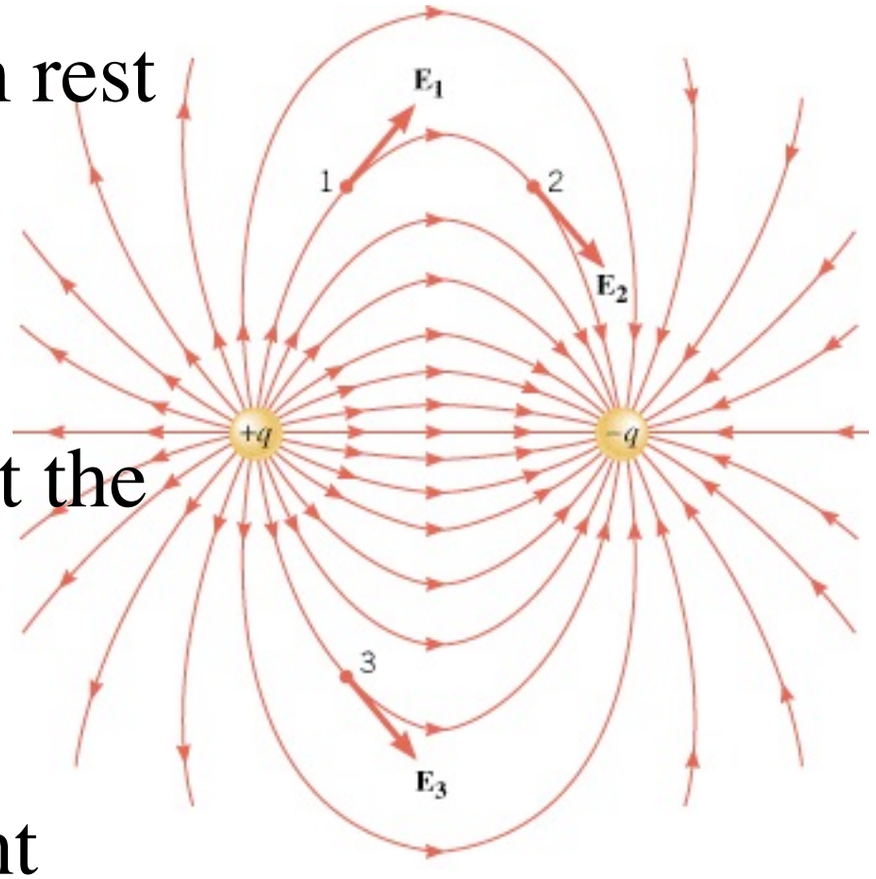
B. the –*x*-direction.

C. the +*y*-direction.

D. the –*y*-direction.

E. none of the above

A positive point charge $+Q$ is released from rest in an electric field. At any later time, the velocity of the point charge



A. is in the direction of the electric field at the position of the point charge.

B. is directly opposite the direction of the electric field at the position of the point charge.

C. is perpendicular to the direction of the electric field at the position of the point charge.

D. is zero.

E. not enough information given to decide

Which electric field is responsible for the trajectory of the proton?