

Homework Assignment #2 - Thursday June 16, 2005

1. (a) On a piece of graph paper (remember that some are available on the course web page) place a $-3 \mu\text{C}$ charge at the origin and a $+2 \mu\text{C}$ at the point $(x = 3.0 \text{ m}, y = 0)$.

(b) Determine the magnitude of the electric forces acting on each of the two charges and sketch these forces on your diagram. Write down your force magnitudes below:

Magnitude of force on $-3 \mu\text{C}$ charge:

Magnitude of force on $+2 \mu\text{C}$ charge:

2. Repeat for the following situations. You can use the same piece of graph paper if you plan out your scale properly and place the origin at a new position

(a) a $+3 \mu\text{C}$ charge at $(0, 2.0 \text{ m})$ and a $+2 \mu\text{C}$ at the point $(x = 3.0 \text{ m}, y = 2.0 \text{ m})$

Magnitude of force on $+3 \mu\text{C}$ charge:

Magnitude of force on $+2 \mu\text{C}$ charge:

(b) a $-4 \mu\text{C}$ charge at $(0, -2.0 \text{ m})$ and a $-2 \mu\text{C}$ at the point $(-3.0 \text{ m}, -2.0 \text{ m})$

Magnitude of force on $-2 \mu\text{C}$ charge:

Magnitude of force on $-4 \mu\text{C}$ charge:

3. On your old graph paper or a new one, place a $+3\ \mu\text{C}$ charge at the origin and a charge of $+2\ \mu\text{C}$ charge at the point ($x = 3.0\ \text{m}$, $y = 4.0\ \text{m}$).

(a) Sketch the directions of the forces on each charge and determine their magnitudes.

Magnitude of force on $+3\ \mu\text{C}$ charge:

Magnitude of force on $+3\ \mu\text{C}$ charge:

(b) Determine the x and y components of the forces on each charge. You can determine the necessary sines and cosines from the components of the displacement between the charges.

$+3\ \mu\text{C}$ charge has force:

x component:

y component:

$+2\ \mu\text{C}$ charge has force:

x component:

y component:

4. On your old graph paper or a new one, place the following charges:

A $+ 3 \mu\text{C}$ charge at the origin

A $- 2 \mu\text{C}$ charge at (3.0 m, 0)

A $+ 3 \mu\text{C}$ charge at (0, 3.0 m)

Determine the x and y components of the two electric forces acting on the charge at the origin, and then determine the total electric force acting on it, giving it first in terms of its x and y components and then in terms of magnitude and direction. Write your answers below:

x component of total force:

y component of total force:

Magnitude of total force:

Direction of total force:

Sketch the electric force contributions and the total electric force on your diagram, and check that the results are consistent with your calculations.