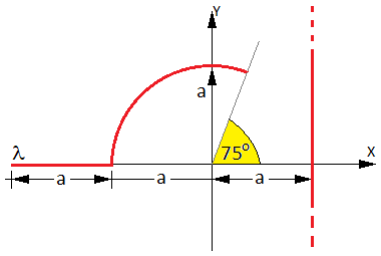
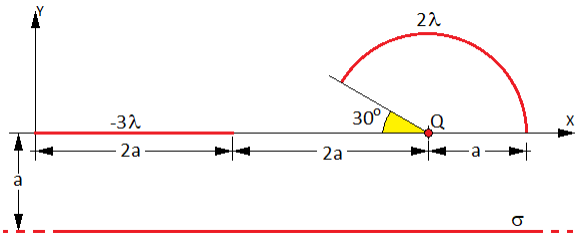
Physics II

More electrostatics problems

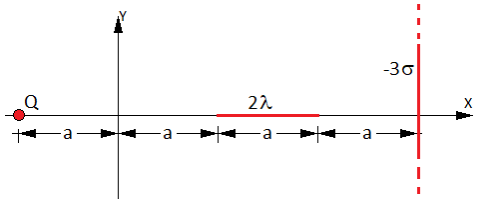
Problem 1.- Find the electric field at the origin of coordinates due to the objects shown in the figure and describe below.
a) A segment of wire of linear charge density λ
b) A wire in the shape of an arc of a circle with radius a, and linear charge density λ.
c) An infinite straight wire with linear charge density λ.



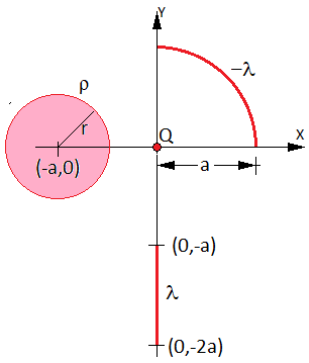
Problem 2.- Find the electric force on the point charge Q (+) located at (4a, 0), due to:
a) The 2a-long wire shown in the figure with linear charge density -3λ
b) A wire in the shape of an arc with radius a, and linear charge density 2λ
c) An infinite plane of surface charge density σ parallel to the xz plane



Problem 3.- You have an infinite plane with surface charge density -3σ, a point charge Q and a wire with linear charge density 2λ. Calculate:
a) The electric force on the point charge.
b) The electric force on the wire.

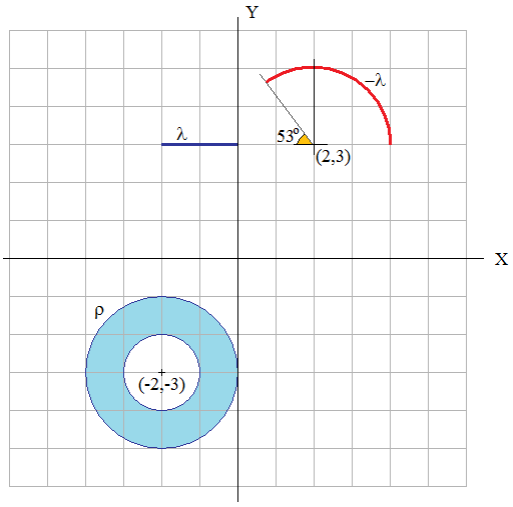


Problem 4.- The figure shows a sphere with radius r and uniform charge density ρ, a wire in the shape of an arc with linear charge density –λ, a straight wire with linear charge density λ and a point charge Q. Find the electric force on Q.



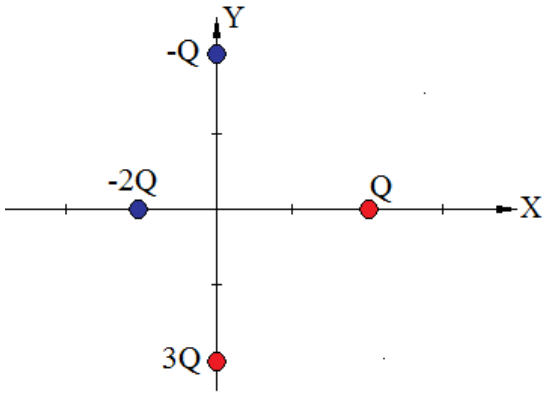
Problem 5.- Find the electric field at point (2,3) due to

a) The straight wire of linear density λ
b) The wire in the shape of an arc with linear charge density –λ
c) The hollow sphere whose charge density for $r = [1\ 2]$ is $\rho = \dfrac{\rho_o}{2\pi r^2}$



Problem 6.- The figure shows four charges:
-Q at (0,2m),
+Q at (2m,0),
-2Q at (-1m,0) and
3Q at (0,-2m).
Calculate:

a) The horizontal component of the electric field (E_x) at the origin of coordinates (0, 0)
b) The vertical component of the electric field (E_y) at the origin of coordinates (0, 0)
c) The magnitude of the electric field at the origin of coordinates (0, 0)
Answer in terms of Q and k (9×10^9 Nm^2/C^2)

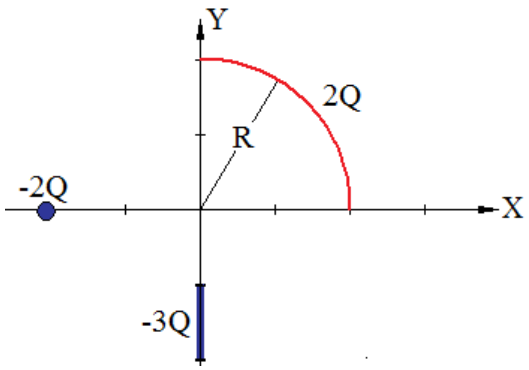


Problem 7.- The figure shows
- A point charge –Q at (-2m,0)
- A 90-degree arc of radius R=2m centered at the origin of coordinates and with uniformly distributed charge over its length equal to +2Q
- A 1-meter wire located between the points (0,-1m) and (0,-2m) with charge -3Q distributed uniformly over its length.

Find the electric field at the origin due to

a) The point charge.
b) The 90-degree arc.
c) The straight wire.

Respond in terms of Q and k (9×10^9 Nm^2/C^2)



Problem 8.- You have three identical charges $q = 1\mu C$ located at the corners of an equilateral triangle with side d = 0.2 m. Calculate the force on one of the charges.

Problem 9.- You have a cylinder with total charge $Q = 1nC$ uniformly distributed over all its volume. Radius $R = 0.1m$, height $h = 4m$ and you want to find the electric field at a point 10m below its base.