

Name: BATTELINO

Discussion Instructor: Battelino Bruno DeSisto Gehrke Izatt
Roshko Sawyer Shastry

PROBLEM 2A AVERAGE: 9.94

A thin wire carries a uniform charge density λ , and is bent into a circular arc that subtends an angle $2\theta_0$ as shown in the figure.

a) Find the electric field at the center of the arc.



Due to symmetry, the electric field vector will be parallel (or antiparallel - depending upon the sign of λ) to the y direction, defined above.

$$dE_y = \frac{k dq}{R^2} \cos \theta$$

$$dq = \lambda ds = \lambda R d\theta$$

$$\therefore dE_y = \frac{k\lambda}{R} \cos \theta d\theta$$

$$E_y = \frac{k\lambda}{R} \int_{-\theta_0}^{\theta_0} \cos \theta d\theta = \frac{k\lambda}{R} [\sin \theta_0 - \sin(-\theta_0)]$$

$$\sin(-\theta_0) = -\sin \theta_0$$

$$\therefore E_y = \frac{2k\lambda}{R} \sin \theta_0$$

