Instructor: Dr. A. Mekki

Name: _____ Key _____ Id: _____

Consider a very long line charge distribution of $\lambda_1 = -2.0$ nC/m and a point charge q = 5 nC as shown in the figure.
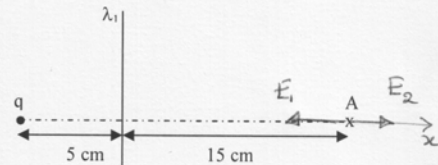
(a) What is the magnitue and direction of the net electric field at point A located as shown?

$$\vec{E} = \vec{E_2} - \vec{E_1}$$

$$= \frac{kq}{r_2^2}\hat{\imath} - \frac{2k\lambda}{r_1}\hat{\imath}$$

$$= \frac{9 \times 10^9 \times 5 \times 10^{-9}}{(0.2)^2}\hat{\imath} - \frac{2 \times 9 \times 10^9 \times 2 \times 10^{-9}}{0.15}\hat{\imath}$$

$$= 1125\,\hat{\imath} - 240\,\hat{\imath} = 885\,\hat{\imath}\,\left(\frac{N}{C}\right)$$

(b) What is the electric flux through a Gaussian surface centered on the point charge q having a radius of 3 cm?

$$\phi = \frac{q_{encl}}{\varepsilon_0} = \frac{q}{\varepsilon_0} = \frac{5 \times 10^{-9}}{8.85 \times 10^{-12}} = 565 \;\; \frac{N}{C}\cdot m^2$$