Consider a long (supposedly infinitely long) line of charge with charge per unit length $\lambda$. We would like to find the electric field $E$ a distance $r$ from the line.

Suppose the electric field is radial (points directly away from the line of charge).

To find the field, you can use Gauss’ law. Pick a gaussian surface that is a cylinder of radius $r$ and length $L$. Here is what you do: 1.) Calculate the flux of the electric field through the gaussian surface. 2.) Calculate the charge inside the gaussian surface. 3.) Set the flux equal to the charge divided by $\epsilon_0$.

**Hint:** The surface area of the outside of the cylinder is $2\pi rL$. The surface area of each end cap is $\pi r^2$.

Multiple choice:

(a) $E = \lambda L$.

(b) $E = \frac{\lambda L}{2\pi \epsilon_0 r}$

(c) $E = \frac{\lambda}{2\pi \epsilon_0 r}$

(d) $E = \frac{\lambda L}{\pi r^2}$

(e) $E = \frac{\lambda \pi r^2}{\epsilon_0}$

(f) $E = \frac{\lambda}{\pi \epsilon_0 r^2}$

(g) $E = \frac{\lambda L}{2\pi \epsilon_0 r^2}$

(h) $E = \frac{\lambda}{4\pi \epsilon_0 r^2}$

(i) None of the above.

(j) All of the above.

**Answer:** __________________________