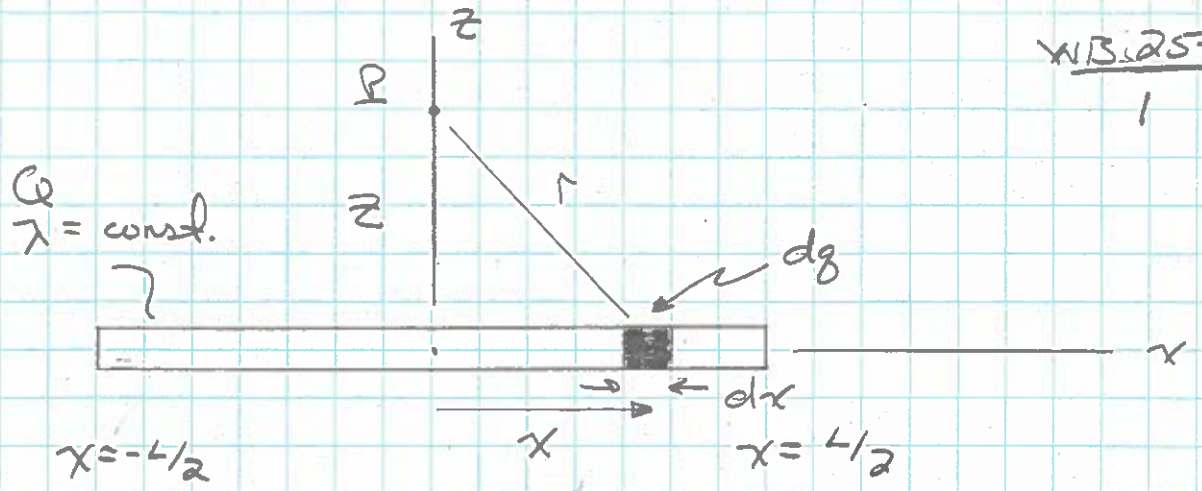

Potential at P: $dV = \frac{K\,dq}{r}$

where $dq = \lambda dx$ and $r = \sqrt{x^2+z^2}$

So:

$$dV = \frac{K\lambda dx}{\sqrt{x^2+z^2}}$$

and

$$V = \int_Q dV = \int_{-L/2}^{L/2} \frac{K\lambda dx}{\sqrt{x^2+z^2}} = K\lambda \int_{-L/2}^{L/2} \frac{dx}{\sqrt{x^2+z^2}}$$

Tables: $\int \frac{dx}{\sqrt{x^2 \pm a^2}} = \ln\left(x + \sqrt{x^2 \pm a^2}\right)$

So

$$V = K\lambda \ln\left(x + \sqrt{x^2+z^2}\right)\Big|_{-L/2}^{L/2}$$

$$= K\lambda \left\{ \ln\left(\frac{L}{2} + \sqrt{\frac{L^2}{4}+z^2}\right) - \ln\left(-L/2 + \sqrt{L^2/4+z^2}\right) \right\}$$

$$\therefore V = \frac{KQ}{L} \ln\left\{ \frac{\sqrt{L^2/4+z^2} + L/2}{\sqrt{L^2/4+z^2} - L/2} \right\}$$