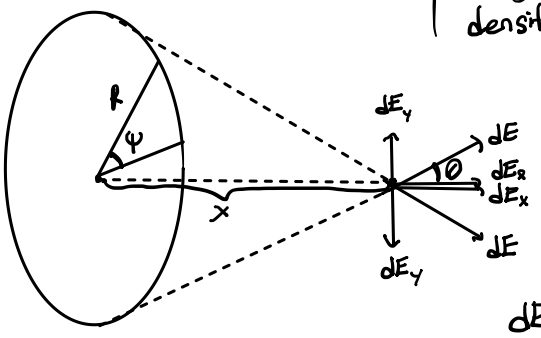
(charge density ; λ) $\left(\lambda = \frac{Q}{2\pi R}\right)$



dE_y's cancel out due to symmetry

$$dE_x = dE\cos\theta = \frac{1}{4\pi\varepsilon_0}\frac{dq}{(x^2+R^2)}\frac{x}{\sqrt{x^2+R^2}}\hat{x}$$

$$dq = \lambda ds$$

$$ds = R\,d\psi$$

$$\Rightarrow dE_x = \frac{1}{4\pi\varepsilon_0}\frac{\lambda R x}{(x^2+R^2)^{\frac{3}{2}}}\hat{x}\,d\psi$$

$$\int dE_x = \int_0^{2\pi} \frac{1}{4\pi\varepsilon_0}\frac{\lambda R x}{(x^2+R^2)^{\frac{3}{2}}}\hat{x}\,d\psi = \frac{1}{4\pi\varepsilon_0}\frac{\lambda R x}{(x^2+R^2)^{\frac{3}{2}}}\cdot 2\pi\hat{x} = \frac{Rx}{2\varepsilon_0(x^2+R^2)^{\frac{3}{2}}}\cdot\frac{Q}{2\pi R}\hat{x} = \frac{1}{4\pi\varepsilon_0}\frac{Qx}{(x^2+R^2)^{\frac{3}{2}}}\hat{x} = \frac{kQx}{(x^2+R^2)^{\frac{3}{2}}}\hat{x} = \vec{E}$$