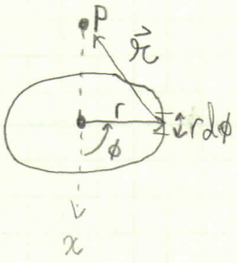
2.5




$$\vec{r} = r\hat{s} + z\hat{z} = r\cos\phi\hat{x} + r\sin\phi\hat{y} + z\hat{z}$$

$$r = \sqrt{r^2 + z^2}$$

$$\hat{r} = \frac{r\hat{s} + z\hat{z}}{\sqrt{r^2+z^2}} = \frac{r\cos\phi\hat{x} + r\sin\phi\hat{y} + z\hat{z}}{\sqrt{r^2+z^2}}$$

$\lambda = \text{const.}$ $\quad dl' = r\,d\phi$ $\quad \phi \in [0, 2\pi)$

$$E = k\int \frac{\lambda}{r^2}\hat{r}\,dl' = k\lambda\int_0^{2\pi} \frac{r\cos\phi\hat{x} + r\sin\phi\hat{y} + z\hat{z}}{(r^2+z^2)^{3/2}}\,r\,d\phi$$

$$= \frac{k\lambda r}{(r^2+z^2)^{3/2}}\left[\int_0^{2\pi} r\cos\phi\hat{x}\,d\phi + \int_0^{2\pi} r\sin\phi\hat{y}\,d\phi + \int_0^{2\pi} z\hat{z}\,d\phi\right] = \frac{2\pi k\lambda r z}{(r^2+z^2)^{3/2}}\hat{z}$$