Calculate the potential due to a charged ring of radius a along the symmetry axis.

$$V\left(\vec{r}_p\right) = \int_{\substack{\text{all}\\ q}} \frac{k dq_i}{\left|\vec{r}_{ip}\right|}$$

coordinates:

$$\vec{r}_i = x_i\hat{x} + y_i\hat{y} : \vec{r}_p = z_p\hat{z} : \vec{r}_{ip} = -x_i\hat{x} - y_i\hat{y} + z_p\hat{z} : \left|\vec{r}_{ip}\right| = \sqrt{x_i^2 + y_i^2 + z_p^2} = \sqrt{a^2 + z_p^2}$$

dq:

$$dq_i = \lambda a\, d\varphi$$

Then:

$$\vec{V}\left(\vec{r}_p\right) = \int_{\varphi=0}^{\varphi=2\pi} \frac{k\lambda a\, d\varphi}{\sqrt{a^2+z_p^2}} = \frac{2\pi k\lambda a}{\sqrt{a^2+z_p^2}}$$