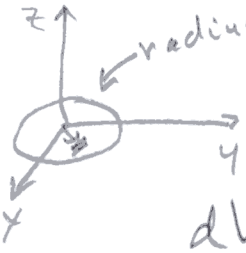
Name .....

Quiz 2
PH361

1. Charge is uniformly distributed on a disc (in the xy plane centered at the origin) with charge density σ. Write an integral expression for the voltage on the z axis due to a dq on the surface of this disc. **DO NOT SOLVE THE INTEGRAL**. Please make it clear what your approach is in solving this problem (what is dq for example).



$\vec{r}' = R\cos\theta\,\hat{x} + R\sin\theta\,\hat{y}$

$\vec{r} = z\,\hat{z}$ $\qquad \vec{\imath} = \vec{r} - \vec{r}'$

$$dV = \frac{k\,dq}{r} = \frac{1}{4\pi\epsilon_0}\frac{\sigma R\,d\theta\,dR}{\sqrt{z^2+R^2}}$$

$$|\vec{\imath}| = \sqrt{-R^2\cos^2\theta - R^2\sin^2\theta + z^2} = \sqrt{z^2+R^2}$$

$$V = \int_0^{R_0}\int_0^{2\pi} \frac{1}{4\pi\epsilon_0}\frac{\sigma R\,d\theta\,dR}{\sqrt{z^2+R^2}}$$

2. Write an integral expression for the flux of the vector function $\vec{v} = (r\cos^2\theta\hat{r} - (r\cos\theta\sin\theta)\hat{\theta} + 3r\hat{\phi}$ on only one octant of the surface of a sphere of radius R. **MAKE SURE YOU CALCULATE THE FLUX THROUGH ONLY THIS ONE SURFACE.**

$\Phi = \int \vec{v}\cdot d\vec{a}$

$d\vec{a} = R\sin\theta\,d\theta\,R\,d\theta\,\hat{r}$

θ from 0 to $\pi/2$ & θ from 0 to $\pi/2$