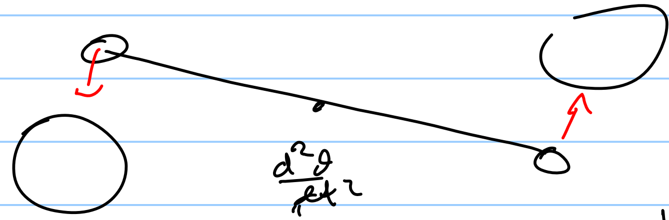
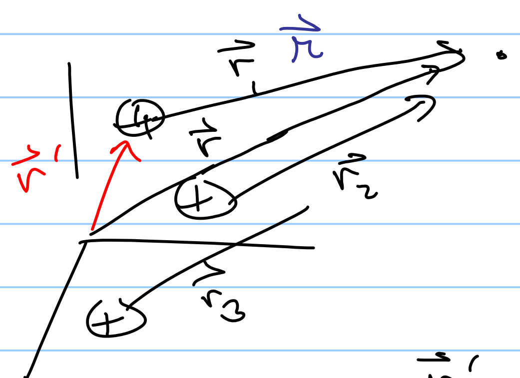
Note Title 1/9/2009



$\tau = I\alpha$ $\qquad$ $\tau = -k\theta$ $\qquad$ $\omega = \sqrt{\frac{k}{I}}$

linear $\qquad$ $F = ma$ $\qquad$ $F = -kx$ spring

$$\omega = \sqrt{\frac{k}{m}}$$



Find $\vec{E}$

$$\sum \frac{kq_i}{|\vec{r}_i|^2}\hat{r}_i$$

$$\vec{r}\,' + \vec{\mathscr{r}} = \vec{r}$$

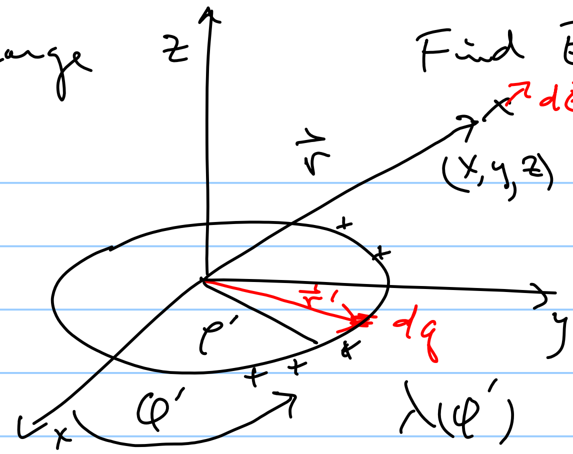
locates source pt. $\qquad$ locates field point

$$\frac{kq_i}{\mathscr{r}^2}\hat{\mathscr{r}}$$

missing

$$- \quad |\vec{\mathscr{r}}| = \left[R^2 \sin^2\theta' (\cdots \right]$$

Problem: ring of charge



Find $\vec{E}$

$d\vec{E} = \frac{k\,dq}{\imath^2}\hat{\imath}$

$\vec{F} = q\vec{E}$

$$\vec{E} = \int \frac{k\,dq}{\imath^2}\hat{\imath}$$

- find $dq = \lambda\, dl'$

$dq = \lambda(\varphi')\,\rho'\,d\varphi'$

$$\int dl = \int_0^{2\pi} \rho\, d\varphi = \rho\, 2\pi$$

- find $\vec{\imath} = \vec{r} - \vec{r}'$

$$\boxed{\vec{r} = x\hat{x} + y\hat{y} + z\hat{z}}$$

$= \rho\hat{\rho} + \varphi\hat{\varphi} + z\hat{z}$

$\rho = \sqrt{x^2+y^2}$, $\varphi = \tan^{-1}\frac{y}{x}$

$\vec{r}' = \rho'\hat{\rho}' + \varphi'\hat{\varphi}' + z'\hat{z}'$, $z' = \phi$

$$\boxed{\vec{r}' = \rho'\cos\varphi'\,\hat{x}' + \rho'\sin\varphi'\,\hat{y}' + 0\,\hat{z}'}$$

$\int d\varphi \_\_\_\_ \hat{\varphi}$

$\hat{\varphi}$ not constant as φ varies & so it <u>cannot</u> be taken outside integral

$\int d\varphi \_\_\_\_ \hat{x}$ $\quad \hat{x}$ comes outside

$$\vec{\imath} = \vec{r} - \vec{r}' = (x - \rho'\cos\varphi')\hat{x} + (y - \rho'\sin\varphi')\hat{y} + (z - 0)\hat{z}$$

$\hat{x} = \hat{x}'$, $\hat{y} = \hat{y}'$, $\hat{z} = \hat{z}'$

$$\hat{\imath} = \frac{\vec{\imath}}{|\vec{\imath}|}$$

$$\vec{E} = \int_0^{2\pi} \frac{k\,\lambda(\varphi')\,\rho'\,d\varphi'}{\left[(x-\rho'\cos\varphi')^2 + (y-\rho'\sin\varphi')^2 + z^2\right]} \; \frac{\left\{(x-\rho'\cos\varphi')\hat{x} + (y-\rho'\sin\varphi')\hat{y} + z\hat{z}\right]}{\sqrt{}}$$