

Name _____

Quiz 10
PH361

$$\vec{p} = \int \vec{r}' \rho(r') dr'$$

$$\vec{F} = (\vec{p} \cdot \nabla) \vec{E}$$

$$E = \frac{1}{4\pi\epsilon_0} \frac{1}{r^3} (3\vec{p} \cdot \hat{r} \hat{r} - \vec{p})$$

$$\nabla t = \frac{\partial t}{\partial r} \hat{r} + \frac{1}{r} \frac{\partial t}{\partial \theta} \hat{\theta} + \frac{1}{r \sin \theta} \frac{\partial t}{\partial \phi} \hat{\phi}$$

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

$$\hat{\theta} = \cos \theta \cos \phi \hat{x} + \cos \theta \sin \phi \hat{y} - \sin \theta \hat{z}$$

$$\hat{\phi} = -\sin \phi \hat{x} + \cos \phi \hat{y}$$

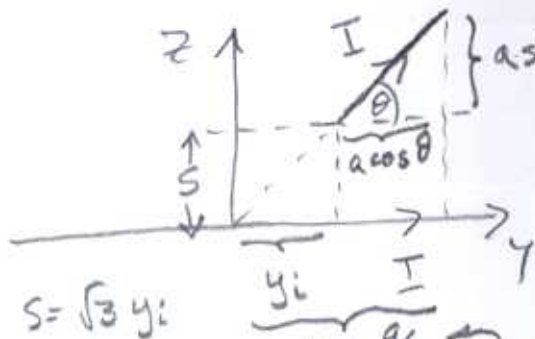
$$\vec{D} = \epsilon_0 \vec{E} + \vec{P}$$

$$\vec{D} = \epsilon \vec{E}$$

$$\vec{E} = q \vec{v} \times \vec{B}$$

$$d\vec{F} = I d\vec{l} \times \vec{B} = \vec{K} \times \vec{B} da = \vec{J} \times \vec{B} dr$$

1. Write an integral expression for the force on the diagonal segment of the triangular loop (equilateral triangle with each side a distance "a") which is a distance s away from an infinite straight wire. Both the wire and loop carry current I. Please do not evaluate the integral.



$$z = \tan \theta y = \sqrt{3} y$$

$$d\vec{l} = dy \hat{y} + dz \hat{z} = dy \hat{y} + \sqrt{3} dy \hat{z}$$

$$\text{Ampere's Law} \Rightarrow \vec{B} = \frac{\mu_0 I}{2\pi z} \hat{x}$$

$$\vec{F} = \int d\vec{F} = \int_{y_i}^{y_f} I d\vec{l} \times \vec{B}$$

$$y_i = \frac{s}{\sqrt{3}}$$

variable of integration is y