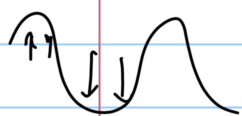
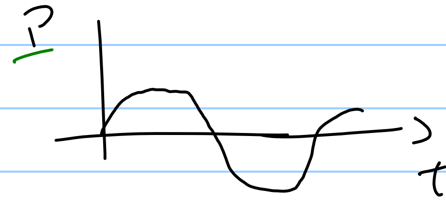
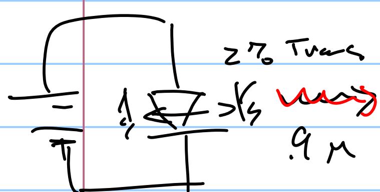
Lecture 26

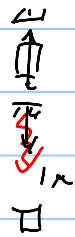
Note Title 3/27/2006



$P \propto E + E^2$

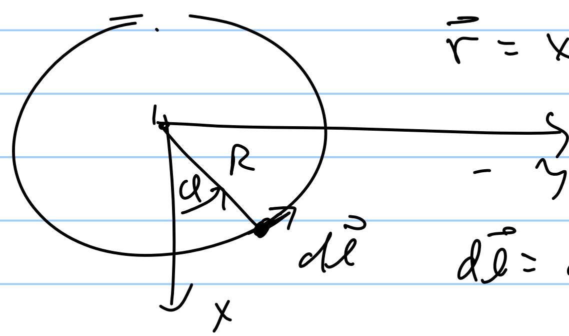






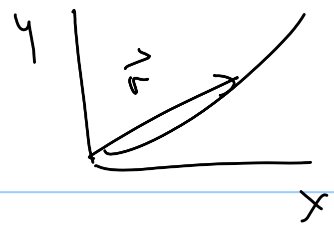
non-linear crystal

freq doubling



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

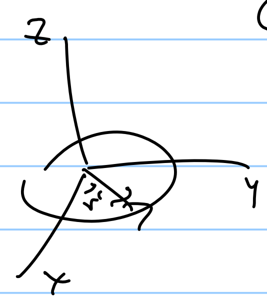
$d\vec{l} = d\vec{r} = R\sin\varphi\,d\varphi\,\hat{x} + R\cos\varphi\,d\varphi\,\hat{y}$



$\vec r = x\hat x + y\hat y \Rightarrow d\vec r = dx\,\hat x + 2x\,dx\,\hat y$

$y = ax^2 \qquad d\vec r = d\vec l$

$\vec{\mathscr{r}} = ?$



$(0, y, z)$

$\vec{\mathscr{r}} = \vec r - \vec r'$

$\vec r = 0\hat x + y\hat y + z\hat z$

↑ field point

$\vec r' = R\cos\theta\,\hat x + R\sin\theta\,\hat y + 0\,\hat z$

integrate over x', y', z'

$$\vec B = \int d\vec B = \int \frac{\mu_0}{4\pi}\frac{I\,d\vec l \times \vec{\mathscr{r}}}{\mathscr{r}^3}$$

Expl. determined

↑ both x, y, z & x', y', z'

$$\boxed{\vec\nabla \cdot \vec B = 0} \qquad \boxed{\vec\nabla \times \vec B = \mu_0 \vec J}$$

magnetostatics

↑ derivatives wrt field coords x, y, z

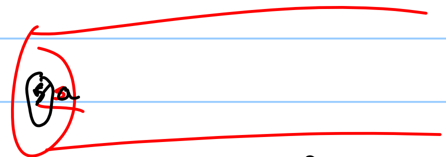
Stokes theorem:

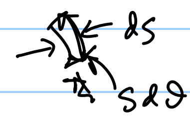
$$\int \underbrace{\vec\nabla\times\underset{\uparrow\, B}{\vec V}}_{\mu_0 J}\cdot d\vec a = \oint \underset{\uparrow\, B}{\vec V}\cdot d\vec l$$

$$\int \mu_0 \vec J\cdot d\vec a = \oint \underbrace{\vec B\cdot d\vec l}_{B\,2\pi r}$$

Curl $\quad da$

area term





$$\int \mu_0 \vec J\cdot \underbrace{d\vec a} = \int_0^r \mu_0 k s\, s\,d\theta\, ds = B\,2\pi r$$

take home exam

$$Q_{lm} = \int T(r,\theta,\phi)\,\frac{\sin(k_m r)}{r}\,P_l(\cos\theta)\left(A\cos m\phi + B\sin m\phi\right)$$

$$\times\, r^2 \sin\theta\, d\theta\, d\phi$$

$t=0$ $\qquad$ $t=.01$ $\qquad$ $t=.02$

$$\frac{\partial T}{\partial t} \propto \nabla^2 T \qquad \sum_n \text{—}\ e^{-n^2\pi^2\kappa t}$$