

#Jenny



Finally I get this ebook, thanks for all these I can get now!

#Rio



Cool! I'am really happy

#Markus Jensen



I did not think that this would work, my best friend showed me this website, and it does! I get my most wanted eBook

#Hun Tsu



wtf this great ebook for free?!

#Che Salsa



My friends are so mad that they do not know how I have all the high quality ebook which they do not!

#Diego Butler



so many fake sites. this is the first one which worked! Many thanks

PHYSICS 880.06 (Fall 2005) Problem Set 1 Solution

(1.1) AKM Problem 1.4

$$\frac{\partial \rho}{\partial t} = -\left(\mathbf{v} \cdot \frac{\partial \rho}{\partial \mathbf{r}} + \nabla \cdot \mathbf{j}\right) - \frac{\partial \rho}{\partial t}$$
$$\mathbf{H} = H_A$$
$$\mathbf{E}(t) = E_0 \cos(\omega t - \mathbf{k} \cdot \mathbf{r})$$

(a) Seek steady-state solution of this form

$$\rho(\mathbf{r}, t) = \text{Re}\left\{ \rho_0(\mathbf{r}) e^{-i\omega t} \right\}$$
$$\rightarrow \text{Re}\left\{ \rho_0(\mathbf{r}) e^{-i\omega t} \right\} = \text{Re}\left\{ \left(\mathbf{E}_0(\mathbf{r}) + \frac{E_0(\mathbf{r})}{m} \right) e^{-i\omega t} \right\}$$

$$\left(-i\omega + \frac{1}{\tau}\right) \rho_0(\mathbf{r}) = -\left(E_0(\mathbf{r}) + \frac{1}{m} \nabla \cdot (\epsilon_0 \mathbf{E}_0(\mathbf{r})) \right)$$
$$\left(-i\omega + \frac{1}{\tau}\right) \rho_0(\mathbf{r}) = -\left(E_0(\mathbf{r}) + \frac{1}{m} \nabla \cdot (\epsilon_0 \mathbf{E}_0(\mathbf{r})) \right)$$
$$\left(-i\omega + \frac{1}{\tau}\right) \rho_0(\mathbf{r}) = -\epsilon_0 E_0(\mathbf{r})$$

$$\mathbf{E}_0(\mathbf{r}) = E_0(\mathbf{r}) \mathbf{e}^{i(\mathbf{k} \cdot \mathbf{r} - \omega t)}$$
$$E_x = \alpha E_0$$
$$E_y = 0$$

The solution is

$$\rho_0 = \frac{-\epsilon_0 E_0}{1 - i\omega\tau + \alpha} e^{i(\mathbf{k} \cdot \mathbf{r} - \omega t)}$$
$$\rho_0 = \frac{\epsilon_0 E_0}{1 - i\omega\tau + \alpha} e^{i(\mathbf{k} \cdot \mathbf{r} - \omega t)}$$
$$\rho_0 = 0$$

where

$$\alpha = \frac{e^2 N \tau}{m \epsilon_0}$$

The current density is

$$\mathbf{j} = -ie \int \frac{d^3 p}{(2\pi)^3} \frac{\mathbf{p}}{m} \rho_0(\mathbf{p}, \mathbf{r}, t)$$
$$j_x = \frac{e^2 N \tau}{m} E_0$$
$$j_y = 0$$
$$j_z = 0$$

where

$$\alpha = \frac{e^2 N \tau}{m \epsilon_0}$$

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