(3) cont

Now find B_2

$$\nabla \times \vec{B}_2 = \mu_0 \epsilon_0 \frac{\partial E_2}{\partial t}$$

$$\int \vec{B}_2 \cdot d\vec{l} = \mu_0 \epsilon_0 \frac{\partial E_2}{\partial t} \int d\vec{a}$$

$$\vec{B}_2 \, 2\pi r = \mu_0 \epsilon_0 \left(\frac{\omega^2 r^2}{4}\right) E_0 e^{i\omega t} \cdot i\omega \cdot \pi r^2$$

$$\vec{B}_2 = \frac{i\omega^3 r^3}{8} \mu_0 \epsilon_0 \, E_0 e^{i\omega t}$$

find E_3

$$\nabla \times \vec{E}_3 = -\frac{\partial B}{\partial t}$$

$$\int E_3 \cdot dl = -\frac{d}{dt}\left[\frac{i\omega^3 r^3}{8} \mu_0 \epsilon_0 i\omega E_0 e^{i\omega t}\right] \cdot \int d\vec{a}$$

$$E_3 \cdot 2s = \frac{\omega^4 r^3}{8} \mu_0 \epsilon_0 E_0 e^{i\omega t} \cdot rs$$

$$E_3 = \frac{\omega^4 r^4}{16} \mu_0 \epsilon_0 E_0 e^{i\omega t}$$

$$\vec{E} = \vec{E}_1 + \vec{E}_2 + \vec{E}_3$$

$$= E_0 e^{i\omega t} - \frac{\omega^2 r^2}{4} \mu_0 \epsilon_0 E_0 e^{i\omega t} + \frac{\omega^4 r^4}{16} \mu_0 \epsilon_0 E_0 e^{i\omega t}$$

$$\begin{cases} c = \frac{1}{\sqrt{\mu_0 \epsilon_0}} \\ \mu_0 \epsilon_0 = \frac{1}{c^2} \end{cases}$$

$$\boxed{\vec{E} = E_0 e^{i\omega t}\left[1 - \left(\frac{\omega r}{c}\right)^2 \frac{1}{4} + \left(\frac{\omega^2 r^2}{c^2}\right)^2 \frac{1}{16}\right]}$$

$$\boxed{\vec{B} = \vec{B}_1 + \vec{B}_2 = \frac{i\omega r}{2} i \mu_0 \epsilon_0 E_0 e^{i\omega t} - \frac{i\omega^3 r^3}{8} \mu_0 \epsilon_0 i E_0 e^{i\omega t}}$$