

PHY 4241/5227 : Advanced Dynamics, Spring 2007

February 23rd, 2007

Assignment # 7

(due Friday March 2nd, 2007, at the beginning of class)

1. Problem 9.9 of Griffiths's book.
2. Consider a magnetic field with components:

$$\begin{aligned} B_x(x, y, z, t) &= -i B_0 \sin\left(\frac{\pi x}{a}\right) e^{i(kz - \omega t)} , \\ B_y(x, y, z, t) &= 0 , \\ B_z(x, y, z, t) &= B_0 \cos\left(\frac{\pi x}{a}\right) e^{i(kz - \omega t)} . \end{aligned}$$

- 2.a) Use $\nabla \cdot \mathbf{B} = 0$ to express the wave number k in terms of a .
 - 2.b) Use the Ampère-Maxwell's law (with $\mathbf{J} = 0$) to compute the electric field \mathbf{E} .
 - 2.c) Verify that the electric field \mathbf{E} satisfies Gauss's law (with $\rho = 0$).
 - 2.d) Use Faraday's law to express the frequency ω in terms of the wave number k .
3. Problem 9.11 of Griffiths's book.
4. Problem 9.33 of Griffiths's book.