The incident wave is \( E_0 \sin(ke-\omega t) \). At \( t=0 \), it is like

\[ E_0 \sin(ke) \]

The reflected wave is \( E_0 \sin(ke+\omega t) \). At \( t=0 \), it looks the same as the wave above, however, the part at \( z>0 \) is moving left, so it cancels the part of the incident wave moving right from \( z<0 \).

The sum is

\[ E_{tot} = E_0 [\sin(ke-\omega t) + \sin(ke+\omega t)] \]

\[ = 2E_0 \cos(ke) \cos(\omega t) \]

as expected, a node at \( 0 \).

The magnetic field has to be oriented so that \( E \times B \) is \( \hat{z} \). Therefore

\[ Bi = B_0 \sin(ke-\omega t) \hat{j} \]

\[ Br = -B_0 \sin(ke+\omega t) \hat{j} \]

\[ B_{tot} = B_0 [\sin(ke-\omega t) - \sin(ke+\omega t)] \hat{j} \]

\[ = -2B_0 \cos(ke) \sin(\omega t) \]

as expected an antinode at \( 0 \).

The rest of the problem follows.

# I drew it upside down on the board and this lead to all the confusion