You have this solution to Maxwell's equations in vacuum:

$$\widetilde{\mathbf{E}}(x, y, z, t) = \widetilde{\mathbf{E}}_0 \exp[i(\mathbf{k} \cdot \mathbf{r} - \omega t)]$$

If this wave travels in the y direction, is polarized in the x direction, and has a complex phase of 0, what is the x component of the physical wave?

A. $E_x = E_0\, cos\,(kx - \omega t)$
B. $E_x = E_0\, cos\,(ky - \omega t)$
C. $E_x = E_0\, cos\,(kz - \omega t)$
D. $E_x = E_0\, cos\left(k_x x + k_y y - \omega t\right)$
E. Something else

The electric fields of two EM waves in vacuum are both described by:

$$\mathbf{E} = E_0 \sin(kx - \omega t)\hat{y}$$

The "wave number" k of wave 1 is larger than that of wave 2, $k_1 > k_2$. Which wave has the larger frequency f?

A. Wave 1
B. Wave 2
C. impossible to tell