The electric field for a plane wave is given by:

$$\mathbf{E}(\mathbf{r},t) = \vec{E}_0 e^{i(\vec{\mathbf{k}}\cdot\vec{\mathbf{r}}-\omega t)}$$

Suppose $\mathbf{E_0}$ points in the +x direction.
Which direction is this wave moving?

A) The x direction.

B) The radial (**r**) direction

C) A direction *perpendicular* to both **k** and **x**

D) The **k** direction

E) None of these/MORE than one of these/???

Think about the first of Maxwell's Equations (Gauss's Law) in vacuum: $\vec{\nabla} \bullet \vec{E} = 0$

Try a complex exponential "linearly polarized plane wave":

$$\vec{E}\left(x,y,z,t\right) = \vec{E}_0 \exp\left[i\left(\vec{k}\bullet\vec{r} - \omega t\right)\right]$$

Then, Gauss's Law becomes:

A) $i\vec{k}\bullet\vec{E}_0 = 0$

C) $i\vec{k}\times\vec{E}_0 = 0$

B) $\vec{k}\left|\vec{E}_0\right| = 0$

D) $\left|i\vec{k}\right|\left|\vec{E}_0\right| = 0$

E) None of these.

What does this mean, in words?