The 3-D wave equation is $\nabla^2 f(x,y,z,t) = \frac{1}{v^2}\frac{\partial^2 f(x,y,z,t)}{\partial t^2}$

One particular "traveling wave" solution to this is often written

$$\tilde{f}_1(x,y,z,t) = \tilde{A}\, e^{i(\vec{k}\cdot\vec{r}-\omega t)}, \text{ where } \tilde{A} = A\, e^{i\delta}.$$

This wave travels in the **k** direction (do you see why?)

This wave has wavelength lambda= 2π/|**k**| (do you see why?)

This wave has period 2π/ω (do you see why?)

This wave has speed v = ω/|**k**| (do you see why?)

What is the real form of this wave?

A) $A\cos(kx - \omega t)$

B) $A\cos(kx - \omega t + \delta)$

C) $A\cos(\vec{\mathbf{k}}\cdot\vec{\mathbf{r}} - \omega t)$

D) $A\cos(\vec{\mathbf{k}}\cdot\vec{\mathbf{r}} - \omega t + \delta)$

E) More than one of these/other/???

A wave is moving in the +z direction:

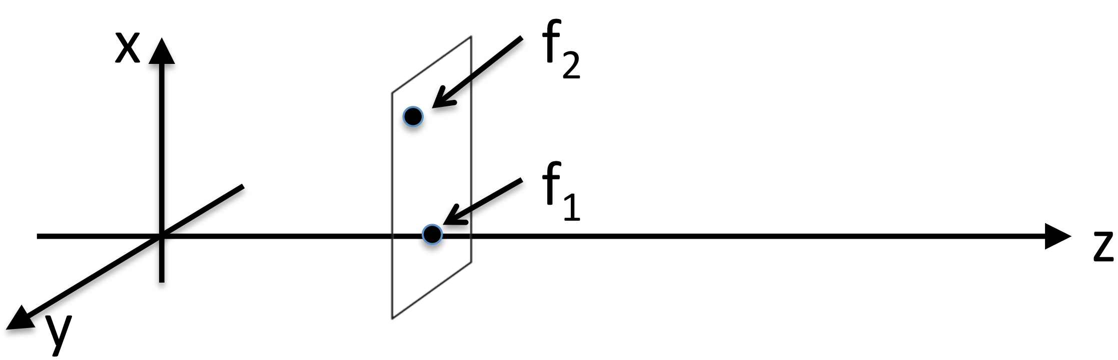
$f(x, y, z, t) = \mathrm{Re}[A\, e^{i(kz - \omega t + \delta)}]$

The value of f at the point $(0,0,z_0, t)$ and the point at (x, y, z_0, t) are related how?

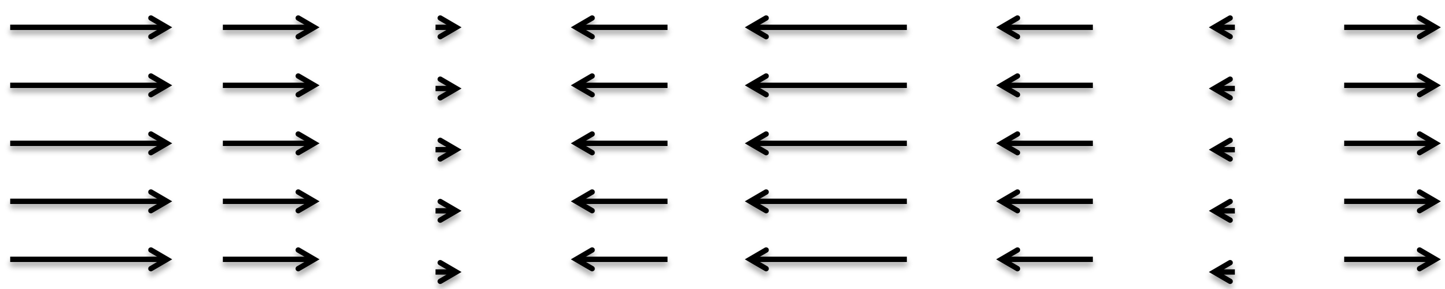
$f_1 = f(0,0,z_0, t)$ vs. $f_2 = f(x, y, z_0, t)$

A) $f_1 = f_2$ always

B) $f_1 >$ or $<$ or $= f_2$ depending on the value of x,y



Here is a snapshot in time of a longitudinal wave:



The divergence of this field is:

A) Zero

B) Non-zero

C) Impossible to tell without further information