I feel confident with one-dimensional waves:

A. Yes
B. Sort of
C. Not really
D. Nope

QUIZ 4 (FRIDAY FEB. 28)

- Maxwell Ampere + Poynting Vector
  - Determine the electric and magnetic field in a situation where there is a displacement current
  - Discuss the direction of the Poynting vector and how it relates to conservation of energy

PAPERS

- Due next Friday (Feb. 28) by 5pm (20% of your grade BTW)

A function, $f(x, t)$, satisfies this PDE:

$$\frac{\partial^2 f}{\partial x^2} = \frac{1}{c^2}\frac{\partial^2 f}{\partial t^2}$$

Which of the following functions work?

A. $\sin(k(x - vt))$

B. $exp(k(-x - vt))$

C. $a(x + vt)^3$

D. All of these.

E. None of these.

A "right moving" solution to the wave equation is:

$$f_R(z,t) = A\cos(kz - \omega t + \delta)$$

Which of these do you prefer for a "left moving" soln?

A. $f_L(z,t) = A\cos(kz + \omega t + \delta)$
B. $f_L(z,t) = A\cos(kz + \omega t - \delta)$
C. $f_L(z,t) = A\cos(-kz - \omega t + \delta)$
D. $f_L(z,t) = A\cos(-kz - \omega t - \delta)$
E. more than one of these!

(Assume k, ω, δ are positive quantities)

Two different functions $f_1(x, t)$ and $f_2(x, t)$ are solutions of the wave equation.

$$\frac{\partial^2 f}{\partial x^2} = \frac{1}{c^2}\frac{\partial^2 f}{\partial t^2}$$

Is $(Af_1 + Bf_2)$ also a solution of the wave equation?

A. Yes, always

B. No, never

C. Yes, sometimes depending on f_1 and f_2

Two traveling waves 1 and 2 are described by the equations:

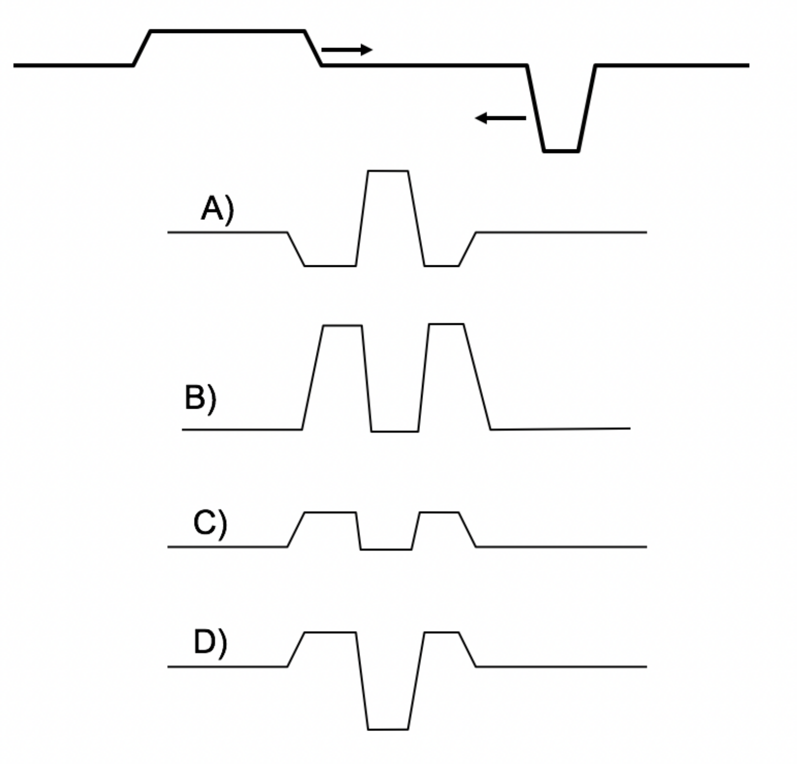
$$y_1(x, t) = 2\sin(2x - t)$$
$$y_2(x, t) = 4\sin(x - 0.8t)$$

All the numbers are in the appropriate SI (mks) units.

Which wave has the higher speed?

A. 1
B. 2
C. Both have the same speed

Two impulse waves are approaching each other, as shown. Which picture correctly shows the total wave when the two waves are passing through each other?



A solution to the wave equation is:

$$f(z,t) = A\cos(kz - \omega t + \delta)$$

- What is the speed of this wave?
- Which way is it moving?
- If δ is small (and >0), is this wave "delayed" or "advanced"?
- What is the frequency?
- The angular frequency?
- The wavelength?
- The wave number?

A solution to the wave equation is:

$$f(z,t) = Re\left[Ae^{i(kz-\omega t+\delta)}\right]$$

- What is the speed of this wave?
- Which way is it moving?
- If δ is small (and >0), is this wave "delayed" or "advanced"?
- What is the frequency?
- The angular frequency?
- The wavelength?
- The wave number?

A complex solution to the wave equation in 3D is:

$$\tilde{f}(\mathbf{r}, t) = \widetilde{A}\, e^{i(\mathbf{k}\cdot\mathbf{r}-\omega t)}$$

- What is the speed of this wave?
- Which way is it moving?
- Why is there no δ?
- What is the frequency?
- The angular frequency?
- The wavelength?
- The wave number?