Phy 4C 2/6

Monday, February 6, 2017 11:55 AM

Goals for the Lecture:

1) Understand the difference between transverse and longitudinal waves
2) Understand the wave function $y(x,t) = Asin(kx - \omega t + \varphi)$ for sin waves and how to use it
3) Velocity of a wave: v=λf
4) Understand and be able to calculate transverse speed and acceleration
5) Understand what affects the speed of a wave on a string and how to calculate it
6) Understand reflection and transmission of mechanical waves

Worksheet p. 137

A) Transverse → up and down

Longitudinal → Left and Right

B) all stay the same

C) only tension changes speed

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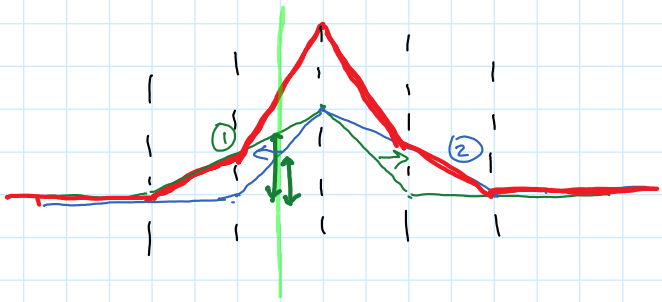
1) continue to move in original direction

Look at pulse height

2) Amplitudes add (larger amplitude)

3) add the amplitudes

4)



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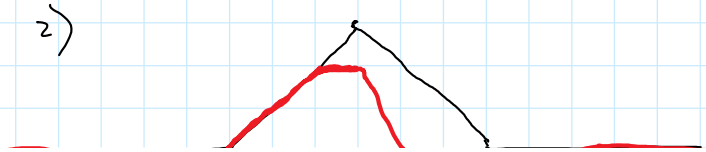
1) yes amplitudes add (displacement from equilibrium)

2)



3) Q stays put ($y = 0$)

4) 2x both → No

2x one → yes

2x one → yes

5)

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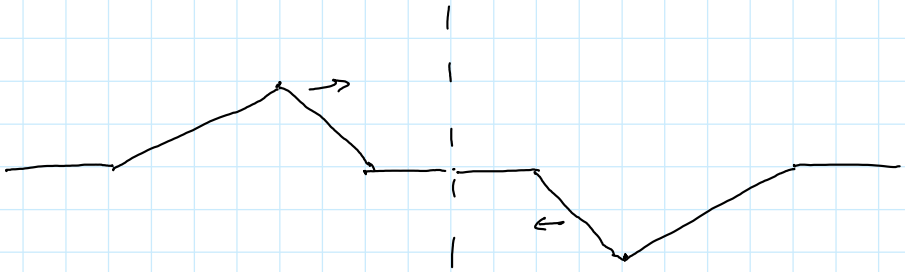
1) same amplitude and width but reflected wave is inverted

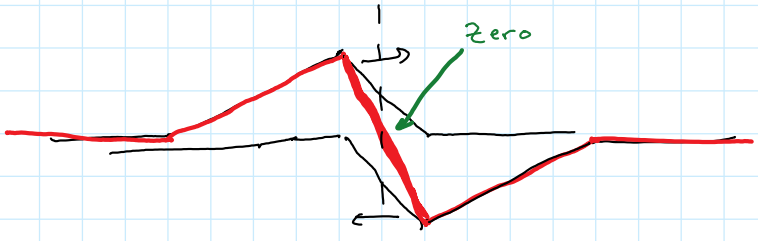
2) Same

3)

$t = 0$



$t = 0.2$

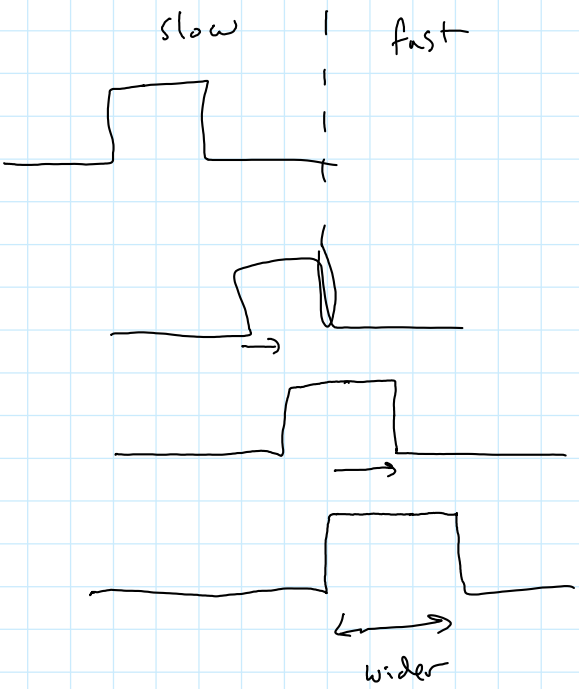


add

p 141 A) splits → some continues
↳ some reflected (inverted)

$W_{incident} > W_{transmitted}$

B) 1) faster on incoming side
(transmitted is slower)



Narrower pulse is in slower medium

C) 1) same

2) density must be different

$$v = \sqrt{\frac{T}{\mu}}$$

↑ mass density

transmitted side (slower) has greater mass density

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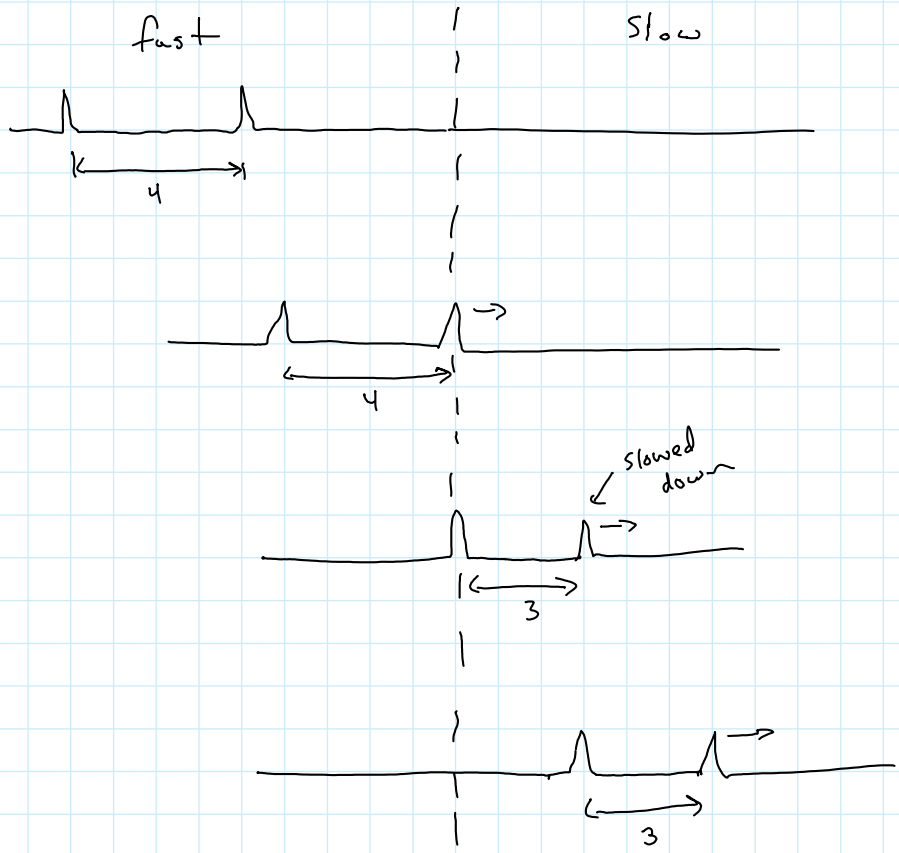
Same springs from previous section

So, $V_x > V_y$



distance gets smaller between transmitted pulses, time is the same!

B) Same (same reason as part A)

width becomes less, but it moves slower

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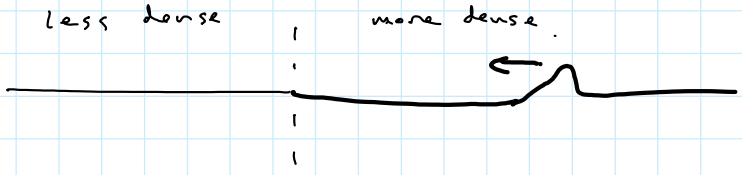


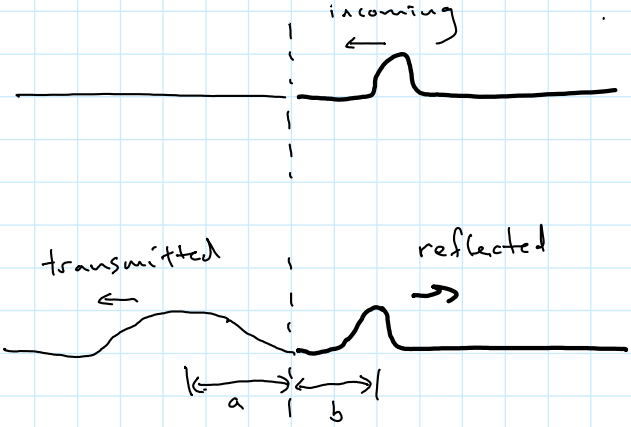
A) always have both reflected and transmitted

Reflected pulse:

- Same side (top of spring)
- Same width (because speed is the same)

Transmitted Pulse:

- same side (top of spring)
- wider (faster medium)



$a > b$ (speed of transmitted is greater)

IV A) fixed end

opposite sides

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p. 144 B) tension → same

mass density → different

speed → different

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mass density

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transmitted pulse is always on the same side as incident pulse

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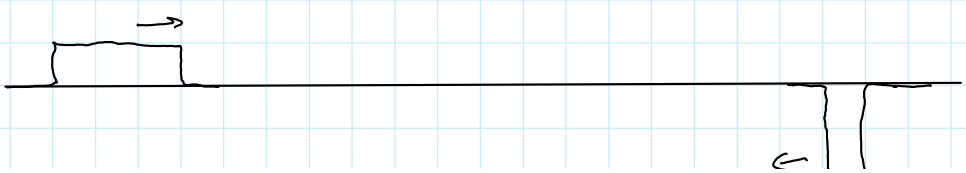
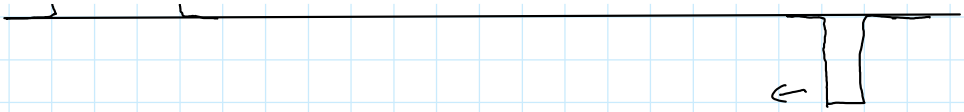
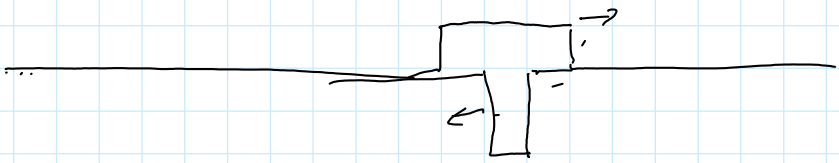
Worksheet p. 383



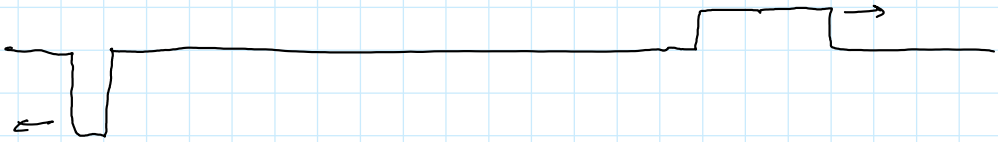


at $t = 0.2\ s$



So, it looks like this

at $t = 0.3\ s$



Book Problem 16-9

$$y = A \sin(kx - \omega t)$$

$$k = \frac{2\pi}{\lambda}$$

$$\omega = 2\pi f = \frac{2\pi}{T}$$

$$v = \lambda f$$

$$y = 0.35 \sin\left(\underbrace{10\pi}_{\omega} t - \underbrace{3\pi}_{k} x + \frac{\pi}{4}\right)$$

a) speed

$$v = \lambda f = \left(\frac{2\pi}{k}\right)\left(\frac{\omega}{2\pi}\right) = \frac{\omega}{k} = \frac{10\pi}{3\pi} = 3\tfrac{1}{3}\ \frac{m}{s}$$

To the right