PHY132S – Waves – Class 3

The swirl of colours is due to interference of light waves reflected by a thin layer of clear oil

Announcements

- On the course web page, the "Lab" section is now named "Practicals"
- This week's Reading Assignment is Chapter 21 – Superposition
- Chapter 21 Suggested Problems: 7, 19, 23, 29, 50, 65, 71, 82 (skip part b, just use the result)
- Problem Set 2 – Chapter 21 is released
  - Due by Friday January 16 by 11:59 PM
- Pre-Class Quiz 2 – Chapter 22 is released
  - Due by Monday January 19 by 10 AM

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MEDICAL RADIATION SCIENCES PROGRAM Open house

- **January 12, 2009 5pm – 7pm**
- **The Michener Institute for Applied Health Sciences, 222 St. Patrick Street**
- **In-depth info on their three program disciplines:**
  - **Nuclear Medicine**
  - **Radiation Therapy**
  - **Radiological Technology**

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Writing is a "Good Thing"

- Gets hand-eye-brain coordinated
- Reading a textbook
  - Fiction: a page a minute
  - Any textbook: this is much too fast
  - Taking detailed notes slows you down
  - Also helps you to concentrate
  - Copy figures, definitions, equations
  - Fill in missing steps of derivations
  - Your choice: keep the notes or not

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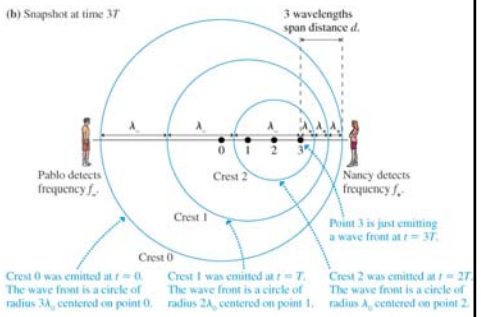
About Figures

- Just passively looking at this figure, you will likely miss many details

- Good idea: copy all figures, captions & labels
- Figures and captions may be tested

Fig 20.26(b)



Last Time

- Source stationary relative to the medium: $f_{source} = f_{wave}$
- Wave moves right/left: $D(x,t) = A\sin(kx \mp \omega t + \phi_0)$
- $\lambda = v/f$
  - property of medium / property of source
- Intensity I = power / area = P / a
  - 3D Wave: $I \sim 1 / r^2$
  - In general: $I \sim A^2$
- Source moves relative to the medium: Doppler Effect
  - Only began this topic

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Today

- Finish §20.7 – Doppler Effect
- Begin Chapter 21 – Superposition
  - §21.1 – The Principle of Superposition
  - §21.2 – Standing Waves
  - §21.3 – Transverse Standing Waves
  - §21.4 – Standing Sound Waves and Musical Acoustics **?**

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Model of *Hercules*, the locomotive used in the first experimental tests of the Doppler Effect

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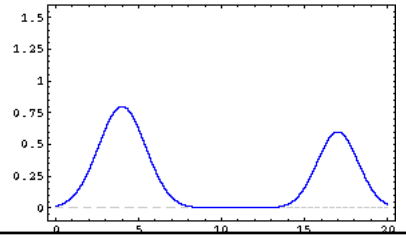
Chapter 21: Principle of Superposition

- If two or more waves combine at a given point, the resulting disturbance is the *sum* of the disturbances of the individual waves.
- Two traveling waves can pass through each other without being destroyed or even altered!



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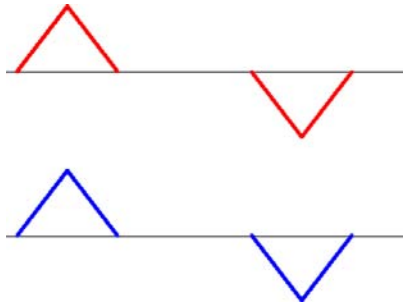
Two triangular wave pulses, one moving to the right and the other moving to the left



Their superposition

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Incident and Reflected Sinusoidal Waves

$$D_{tot} = a\sin(kx-\omega t) + a\sin(kx+\omega t)$$
$$= 2a\sin(kx)\cos(\omega t)$$
$$= A(x)\cos(\omega t)$$

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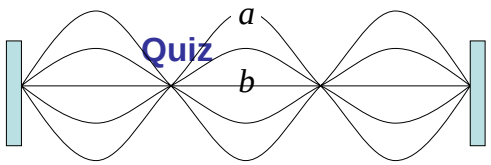
Quiz



- A string is clamped at both ends and plucked so creates a standing wave. Define upward motion to be positive velocities. When the string is in position a, the instantaneous velocity of points along the string
- A. is zero everywhere
- B. is positive everywhere
- C. is negative everywhere
- D. depends on location

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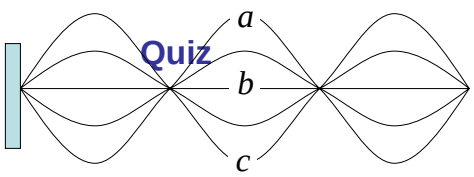

Quiz

- A string is clamped at both ends and plucked so creates a standing wave. Define upward motion to be positive velocities. When the string is in position b, the instantaneous velocity of points along the string
- A. is zero everywhere
- B. is positive everywhere
- C. is negative everywhere
- D. depends on location

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