Physics 122 – Class #5 – Outline

- Announcements/Reading Assignment
- Review of general problems w/ Recitation quiz
- Lensmaker's equation / Mirrors
- Waves
- Properties of sinusoidal waves

Announcements

- We are one week behind the syll.
- You have to pay for the clicker "Reg Code" (unless new clicker)
- IGo clicker does not seem to work …
- Homework WR-02 is posted and due in class next Tuesday. Homework OL-03 due Saturday.
- How recitations run
  - Quizzes are simulated tests
  - Give you a clear idea of what you know
- Importance of reading chapter

Homework

Homework OL-03 is posted.

Problems

OL-03 20.1, 20.3, 20.13, 20.14, 20.22, 20.23, 20.26, 20.29, 20.32, 20.37, 20.53, 20.57, 20.65, 20.74

WR-02 20.4, 20.5, 20.6, 20.41

How I handle homework Errors

I add a note to problem to point out the error.

I give credit to anyone who got bit by it.

I give extra credit 50 points if you report an error the day after the assignment is posted.

30 points if three days after posted

10 points at any time.

EC goes to the first person to point out and explain the error

Focal lengths and Real/Virtual images

- Convex lens f>0
- Concave lens f<0
- Concave mirror f>0
- Convex mirror f<0

- Real image – inverted
  - On opposite of lens (from object)
  - On same side of mirror (from object)

Virtual image – erect

On same side of lens (from object)

On opposite side of mirror (from object)

Reading Assignment

(before recitation)

All of Chapter 20, can skip dB's

Try to understand why

$$D(x,t)=A\sin(kx-\omega t+\varphi_0)$$

Describes a wave traveling to the right.

What is phase? (needed for interference)

$$k=\frac{2\pi}{\lambda} \qquad \omega=\frac{2\pi}{\text{period}}$$

Ch. 23: Geometrical Optics

$$\frac{1}{s}+\frac{1}{s'}=\frac{1}{f}$$

Relation between object and image distance for single lenses and mirrors.

$$m=-\frac{s'}{s}$$

Magnification for single lens or mirror.

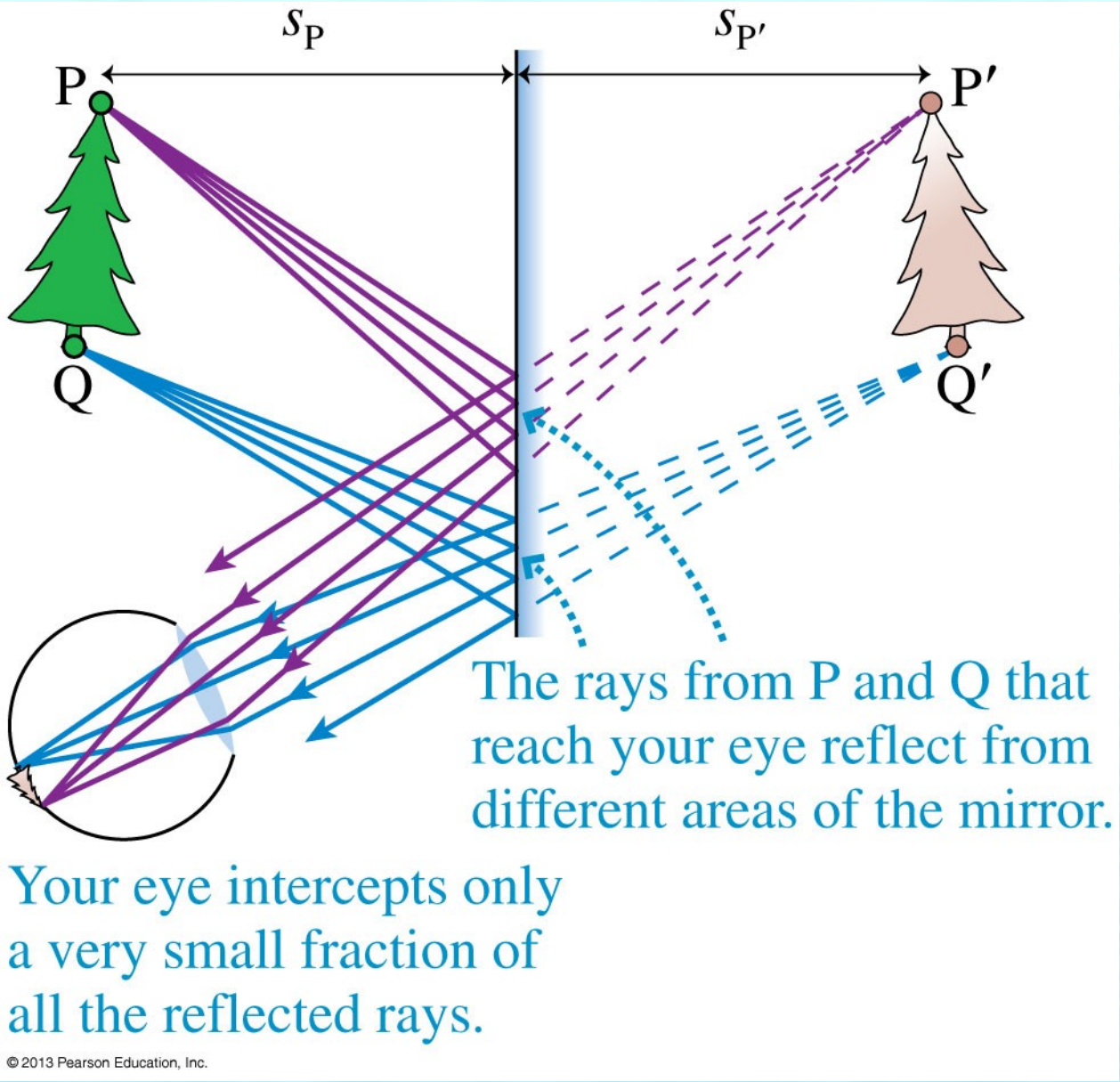
$$\frac{1}{f}=(n-1)\left(\frac{1}{R_1}-\frac{1}{R_2}\right)$$

Lensmaker's formula

$$f=\frac{R}{2}$$

Mirror maker's formula

How a Mirror works



$f = \frac{R}{2}$ Focal length of a flat mirror?

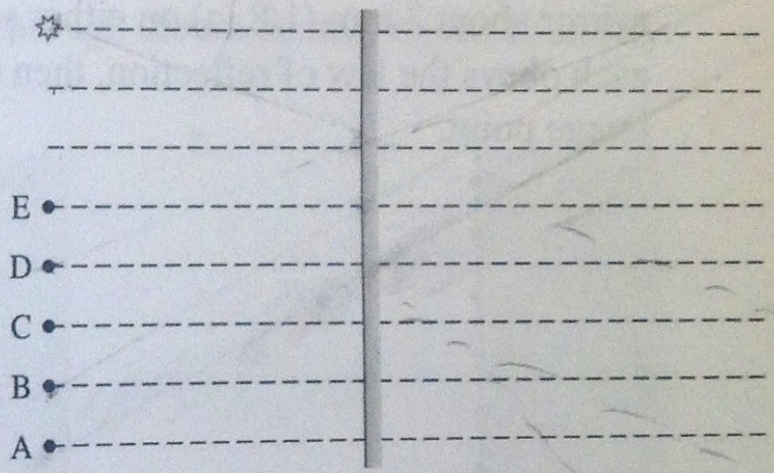
How a Mirror works (recitation quiz)

23.2 Reflection

7. a. Using a straight edge, draw five rays from the object that pass through points A to E after reflecting from the mirror. Make use of the grid to do this accurately.

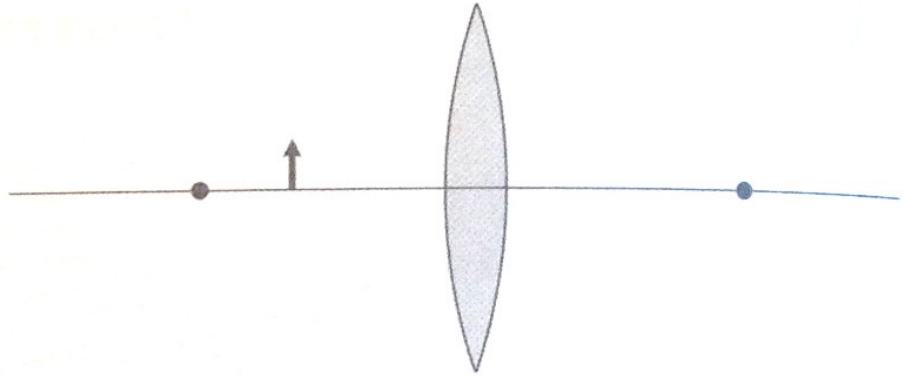
b. Extend the reflected rays behind the mirror.

c. Show and label the image point.



Virtual image with a lens

27. An object is near a lens whose focal points are shown.



a. Use ray tracing to locate the image of this object.

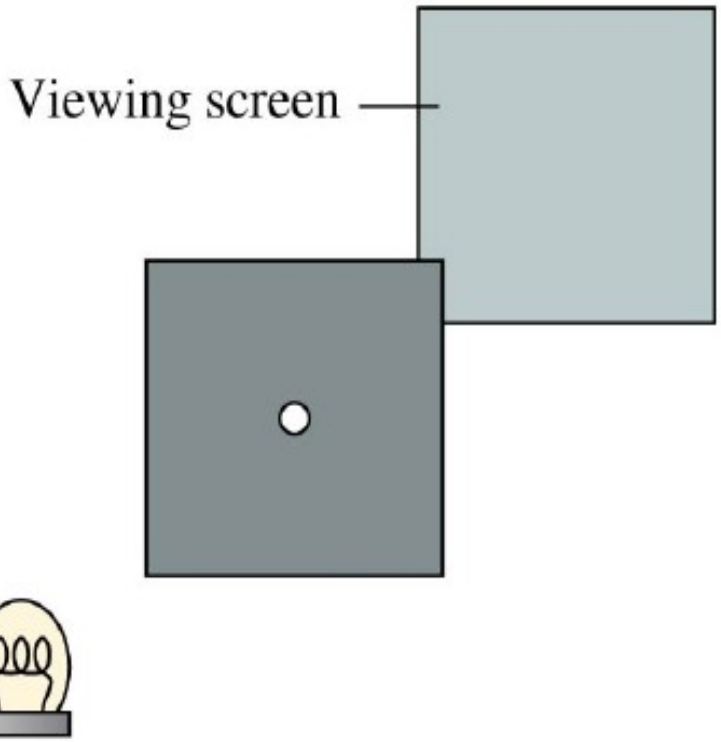
b. Is the image upright or inverted?

c. Is the image height larger or smaller than the object height?

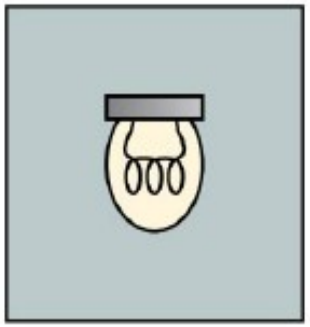
d. Is this a real or a virtual image? Explain how you can tell.

Clicker Question

The dark screen has a small hole, $\approx 2\ \mathrm{mm}$ in diameter. The lightbulb is the only source of light. What do you see on the viewing screen?

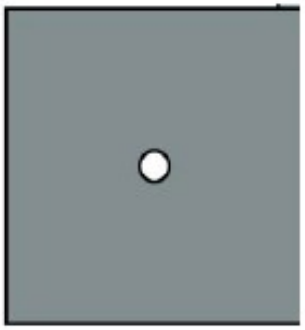


A.



B.

C.



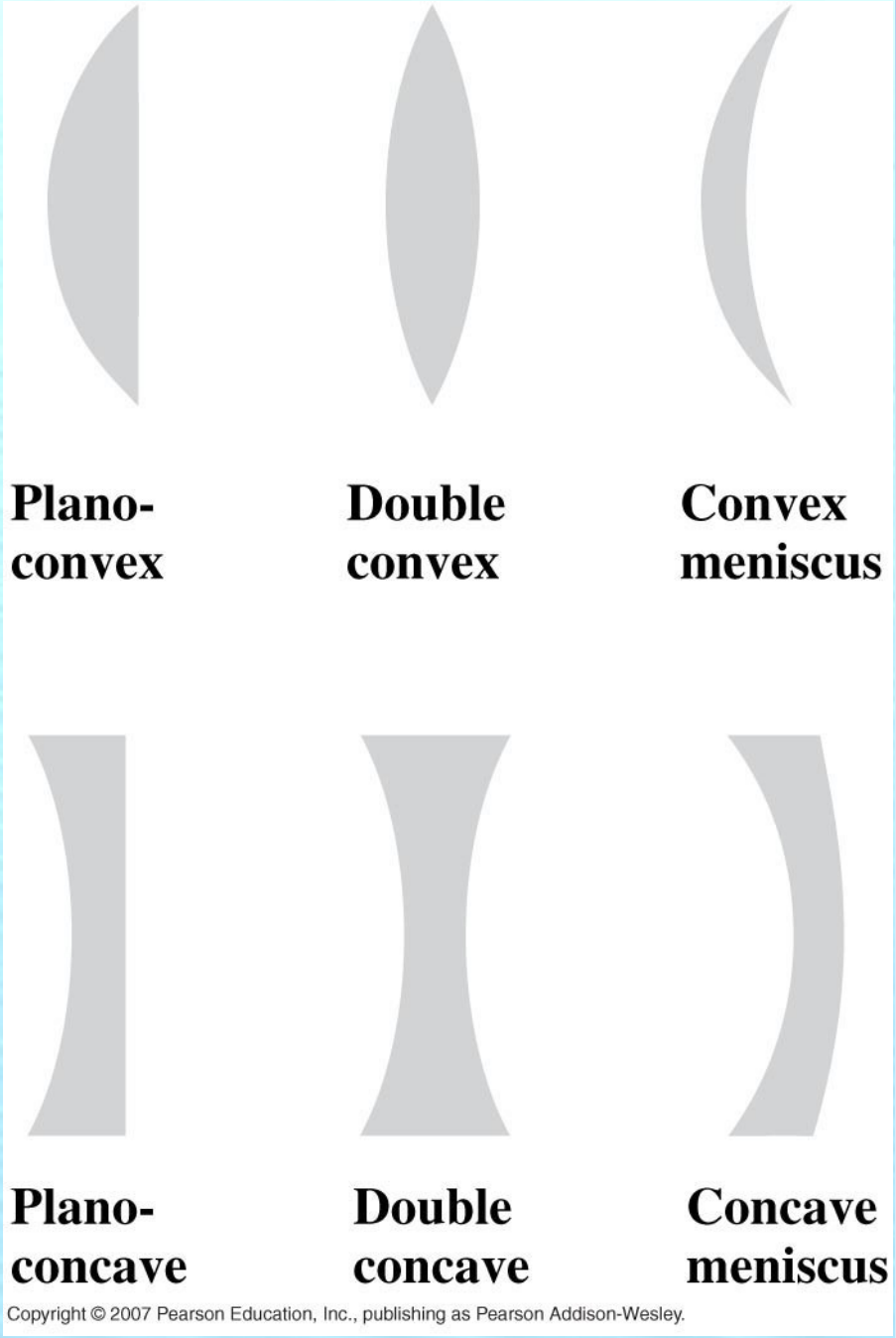
D.

Convex lenses cause light rays to converge.

Concave lenses cause light rays to diverge.

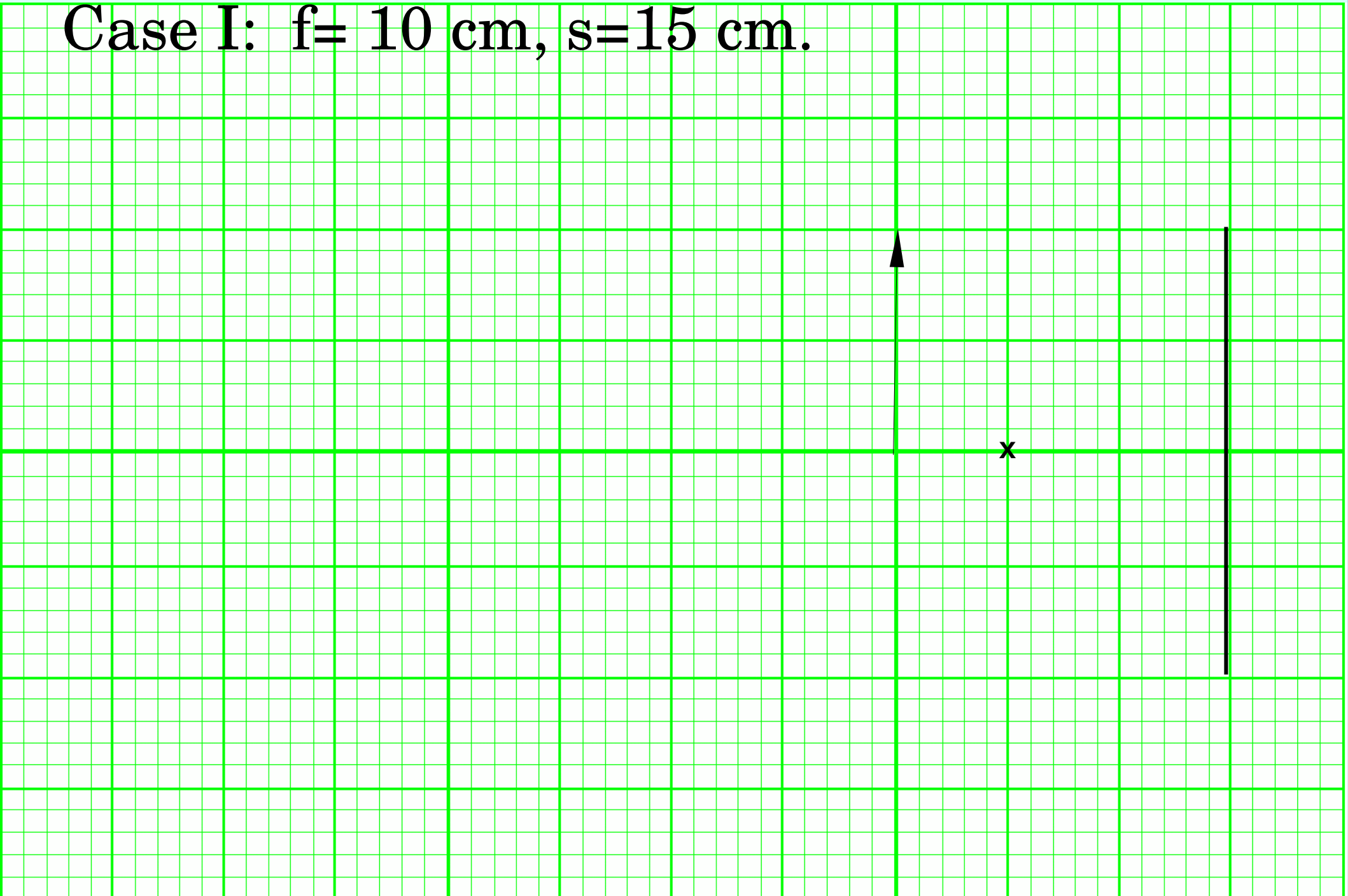
If lens is thicker in the Middle than edges, It will converge

If thicker on edges Than middle, it Will diverge.



Mirror:

Case I: f= 10 cm, s=15 cm.



Mirror:

Case II: f= -10 cm, s=5 cm.

Which of the following changes its focal length when it is immersed in water?

A. a concave mirror

B. a convex mirror

C. a convex lens

D. all of the above

E. none of the above

Ch. 20: Traveling Waves

$$v = f\lambda$$

$$D(x,t) = A\sin\left(2\pi\frac{x}{\lambda} - 2\pi\frac{t}{T} + \Phi\right)$$

$$D(x,t) = A\sin(kx - \omega t + \Phi)$$

$$I = P/a$$

$$I_{spherical} = P_{source}/4\pi r^2$$

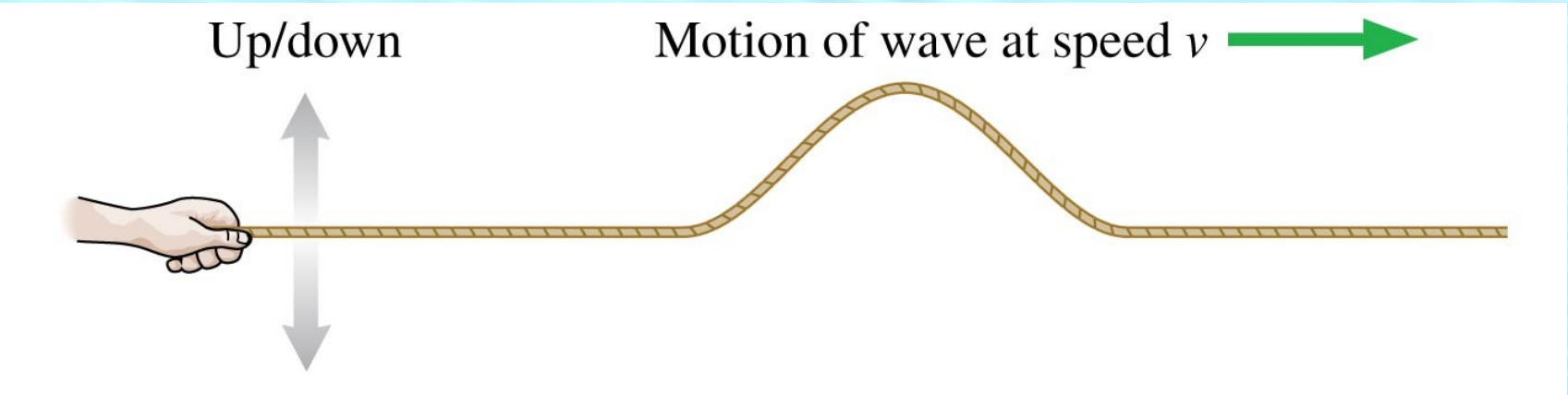
Reading Question #1

A graph showing wave displacement versus position at a specific instant of time is called a

A. Snapshot graph.
B. History graph.
C. Bar graph.
D. Line graph.
E. Composite graph.

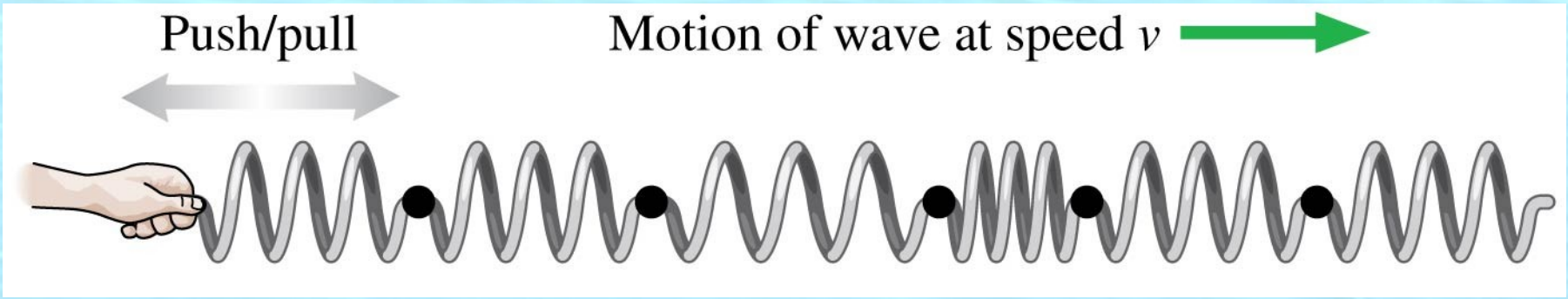
A Transverse Wave

- A **transverse wave** is a wave in which the displacement is *perpendicular* to the direction in which the wave travels.
- For example, a wave travels along a string in a horizontal direction while the particles that make up the string oscillate vertically.



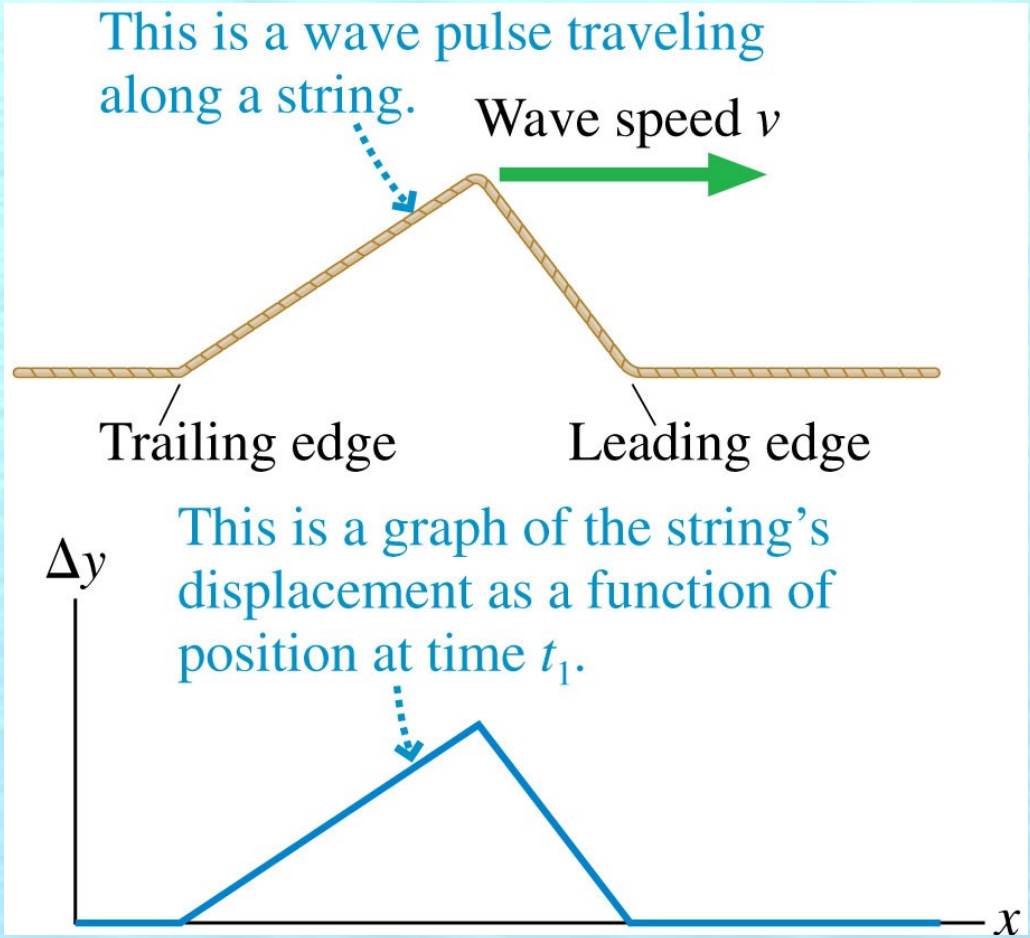
A Longitudinal Wave

- In a **longitudinal wave**, the particles in the medium move *parallel* to the direction in which the wave travels.
- Here we see a chain of masses connected by springs.
- If you give the first mass in the chain a sharp push, a disturbance travels down the chain by compressing and expanding the springs.



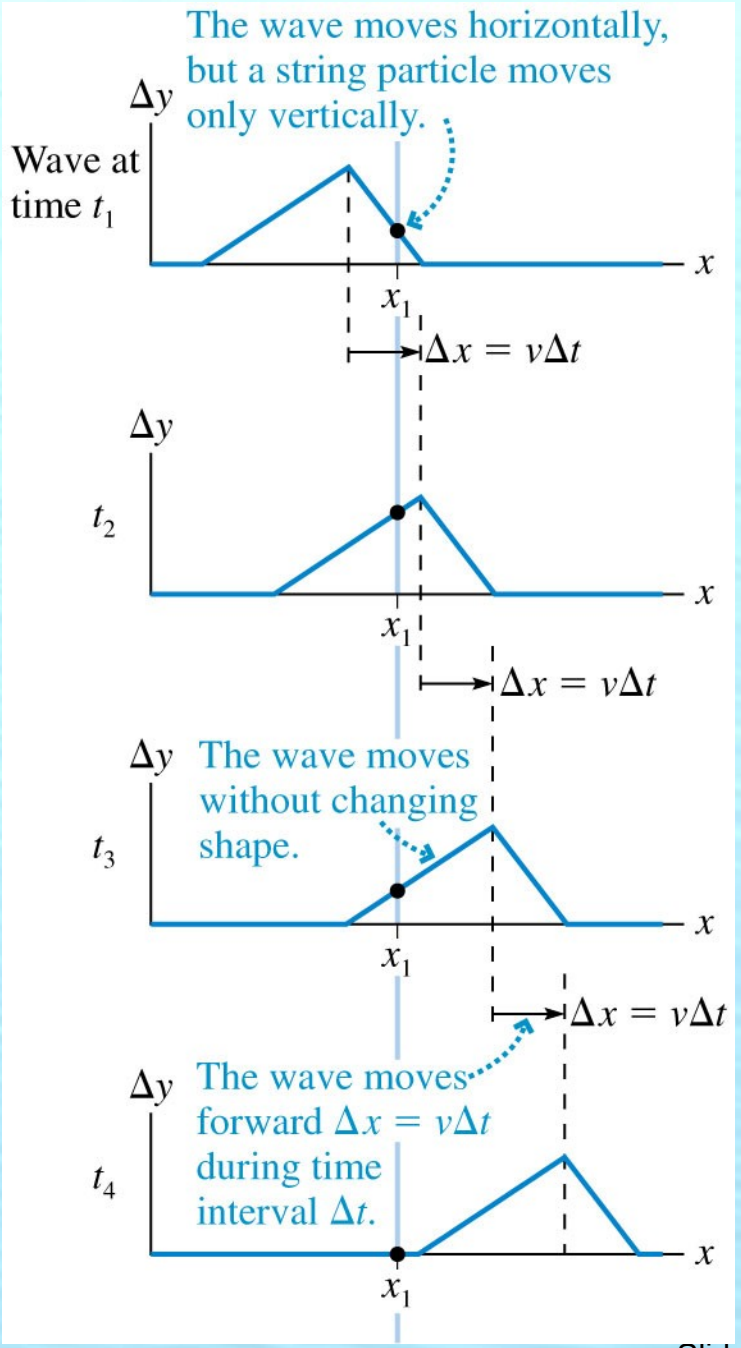
Snapshot Graph

- A graph that shows the wave's displacement as a function of position at a single instant of time is called a **snapshot graph**.
- For a wave on a string, a snapshot graph is literally a picture of the wave at this instant.



One-Dimensional Waves

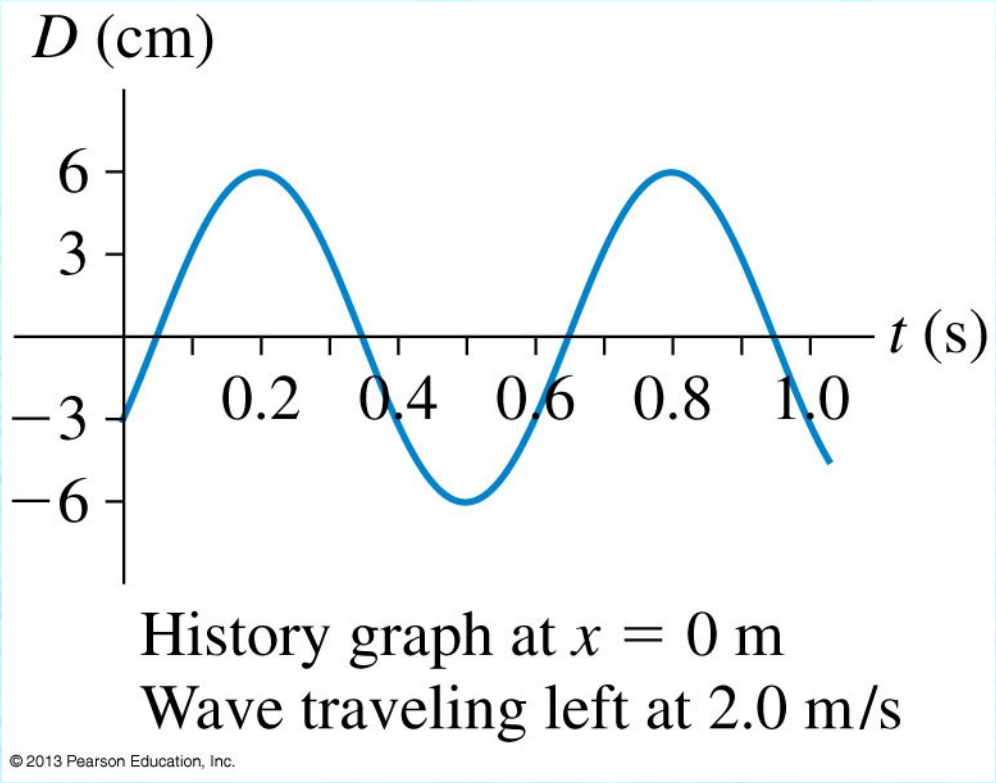
- The figure shows a sequence of snapshot graphs as a wave pulse moves.
- These are like successive frames from a movie.
- Notice that the wave pulse moves forward distance $\Delta x = v\Delta t$ during the time interval Δt.
- That is, the wave moves with *constant speed.*



Homework 20.14

$$D(x,t) = A\sin(kx - \omega t + \Phi)$$

- What are amplitude, frequency, wavelength, and phase of this wave?
- What is the equation of the wave?



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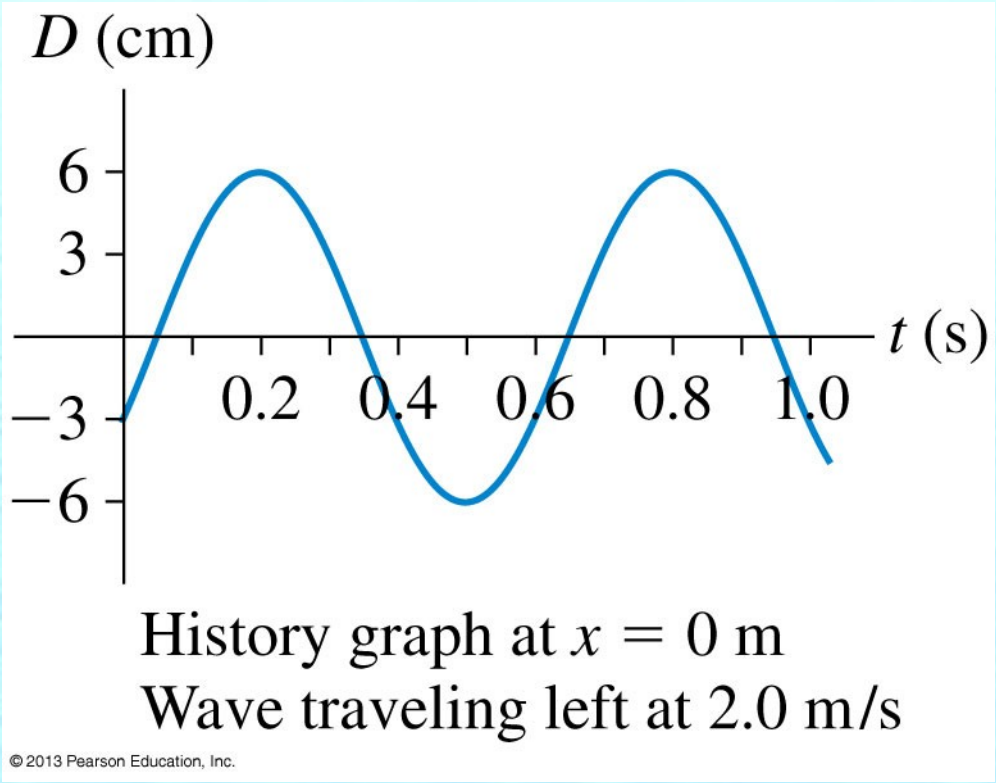

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