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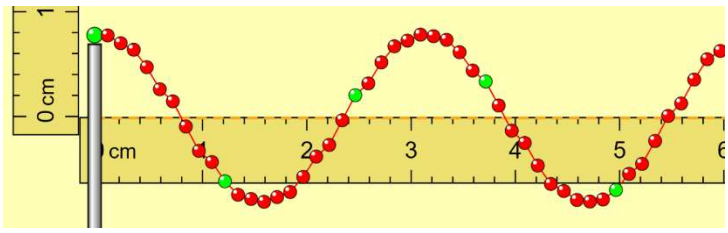
Physics 157 Tutorial 9

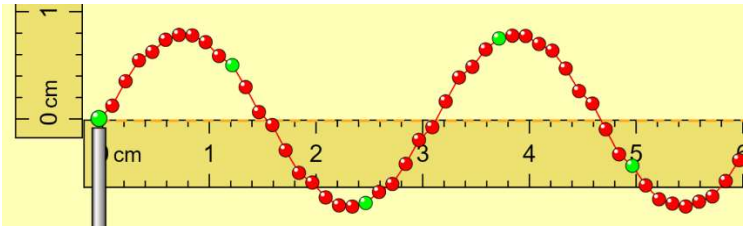
This tutorial will give you some practice with questions about waves.

Formulae and hints are available on the back page.

Problem 1)

$v = 0.8/0.23 = 3.48$ m/s





The pictures show a wave travelling to the right at two nearby times. If the displacement is described by D(x,t) = A cos(kx - ωt), what are A, k, and ω?

$\lambda = \pi$

$A = 0.8$ cm

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

$\omega = 2\pi \cdot f$

$2\pi \cdot \frac{1}{T}$

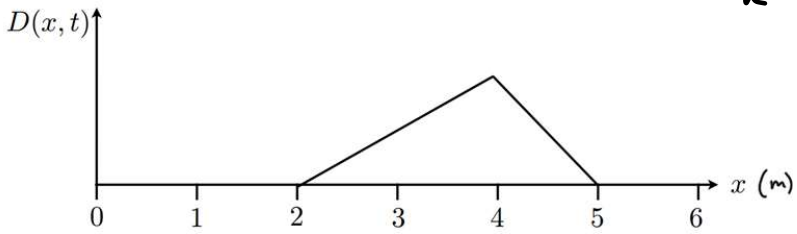
$v = \lambda f = \omega / k$

$\omega = k v$

$\omega = 2 \cdot 3.48$

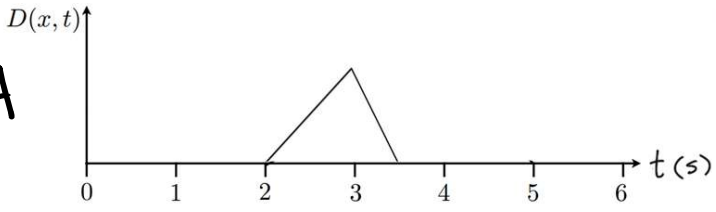
$\omega = 6.96$ rad/sec

Problem 2)

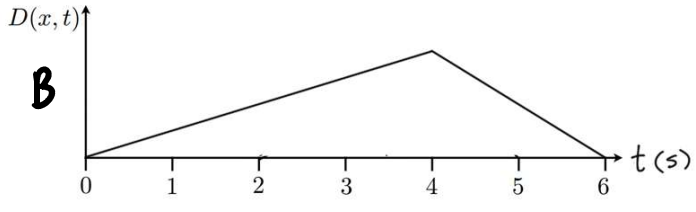


The plot above show the snapshot graph for a wave pulse moving to the right on a string with speed 2 m/s. Which of the graphs below represent the history graph for some point on the string?

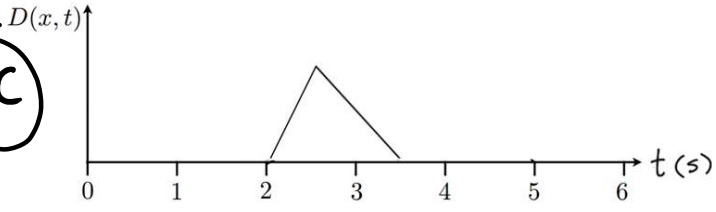
A



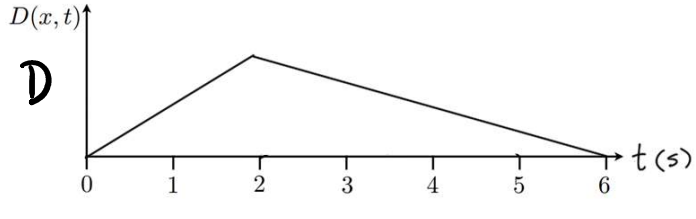
B



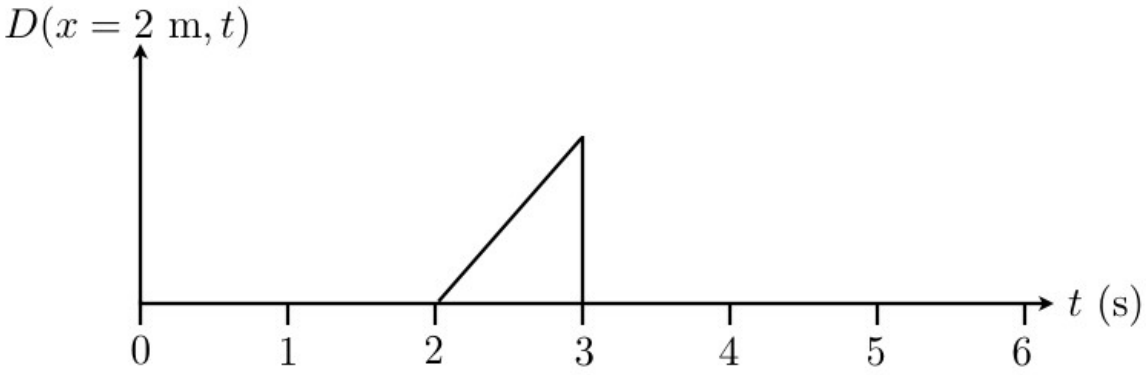
C



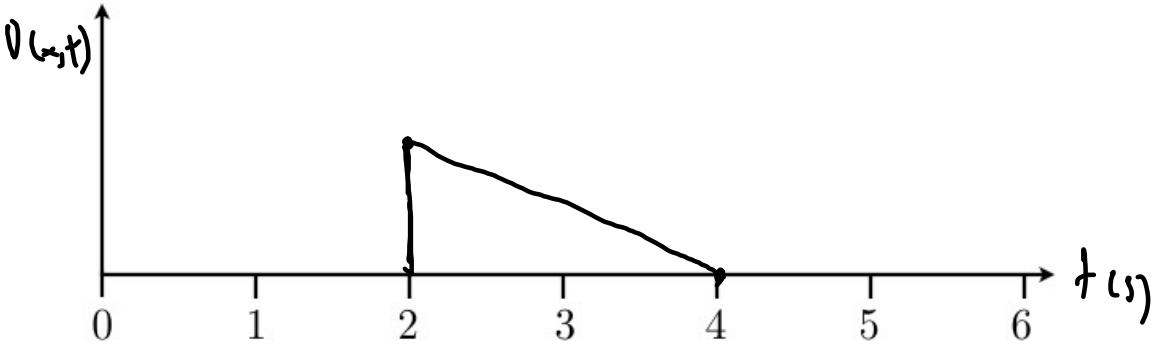
D



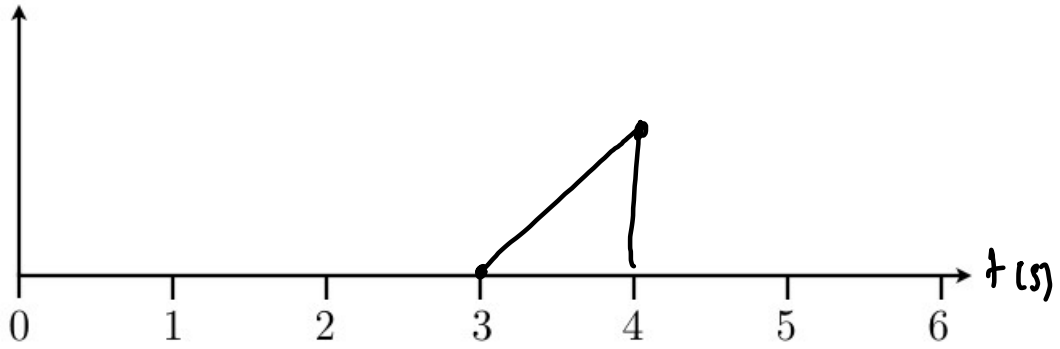
Problem 3) Below is a history graph of a wave pulse travelling at 2 m/s to the right.



a) On the axes below, draw the snapshot graph for t = 3 s. (*see hints on back page if stuck)*



b) On the axes below, draw the history graph at x = 4 m.



Useful formulae:

A wave with amplitude A traveling at velocity v to the right can be represented as

$D(x,t) = A \cos(k x - \omega t)$

We have **$k = 2\pi / \lambda$** where λ is the wavelength.

We have **$\omega = 2\pi f = 2\pi / T$** where f is the frequency and T is the period.

The wave velocity is related to the other quantities by **$v = \lambda / T = \lambda f = \omega / k$**

HINTS for 3a:

What is the shape of a right-moving pulse that would case something to move up and down according to the graph in the first picture?

How long is the pulse in space, taking into account its velocity and how long it takes to pass by?

From the first graph, what part of the pulse is at x=2m at time 3s?