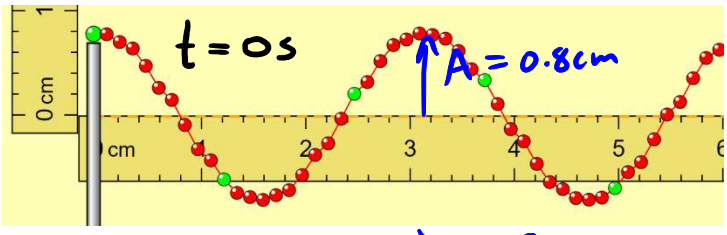
Name:
Student number:

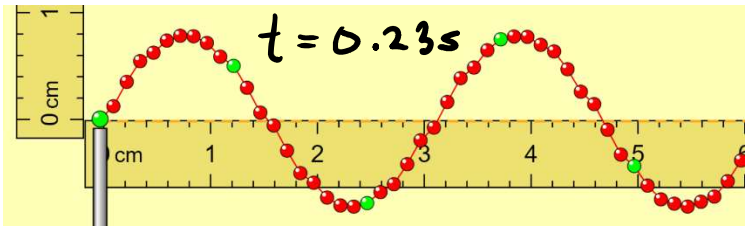
Physics 157 Tutorial 9 - Solutions

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

Formulae and hints are available on the back page.

Problem 1)





$\lambda = 3cm$, so $k = \frac{2\pi}{\lambda} = 2.09 cm^{-1}$

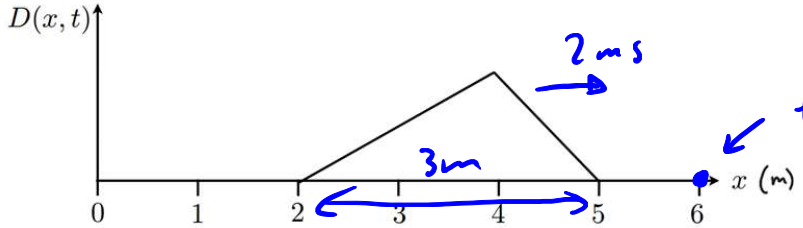
0.23s is T/4 so T = 0.92s

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?

$\omega = \frac{2\pi}{T} = 6.82 s^{-1}$

$A = 0.8cm$, $k = 2.1 cm^{-1}$, $\omega = 6.82 s^{-1}$

Problem 2)

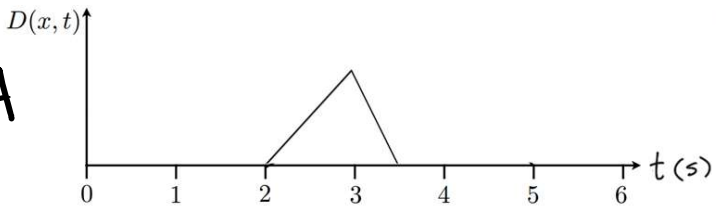


this point will move upward quickly then downward more slowly

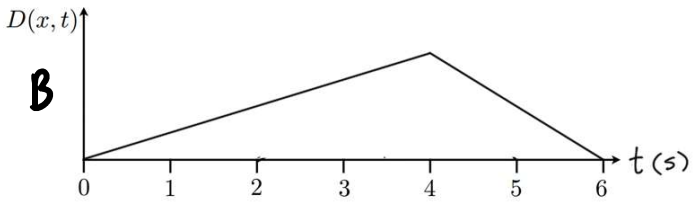
whole pulse passes by in t = 3m/(2m/s) = 1.5s

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?

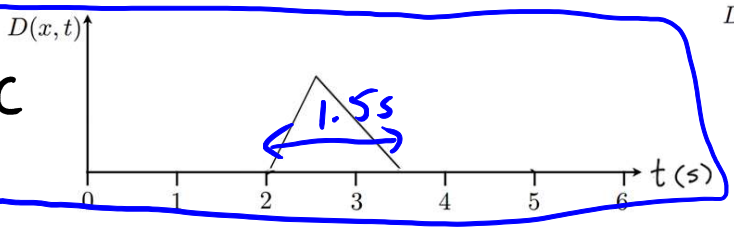
A



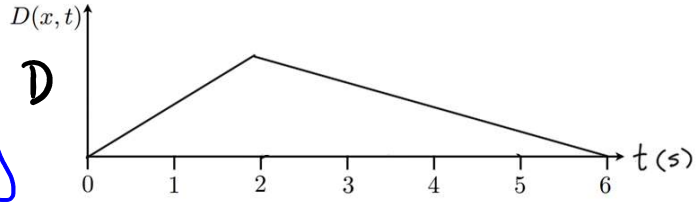
B



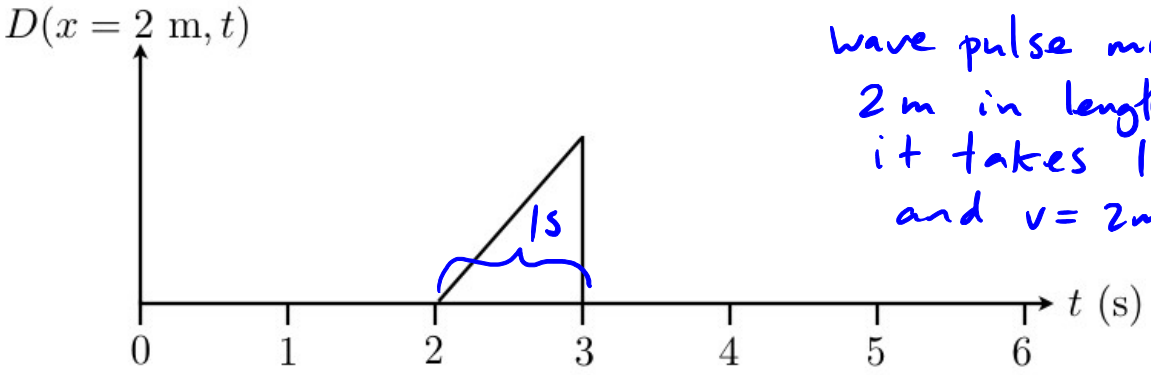
C



D



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

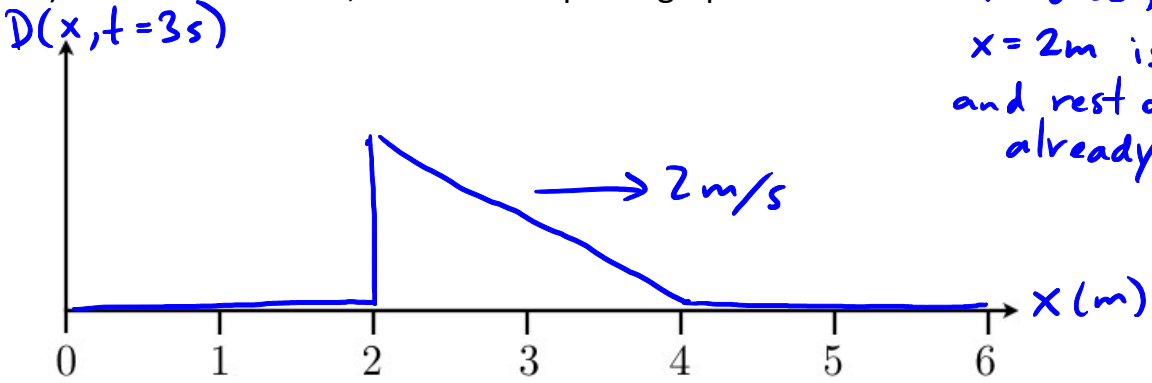


wave pulse must be 2 m in length, since it takes 1s to pass by and v = 2m/s

↓ shape will be reversed

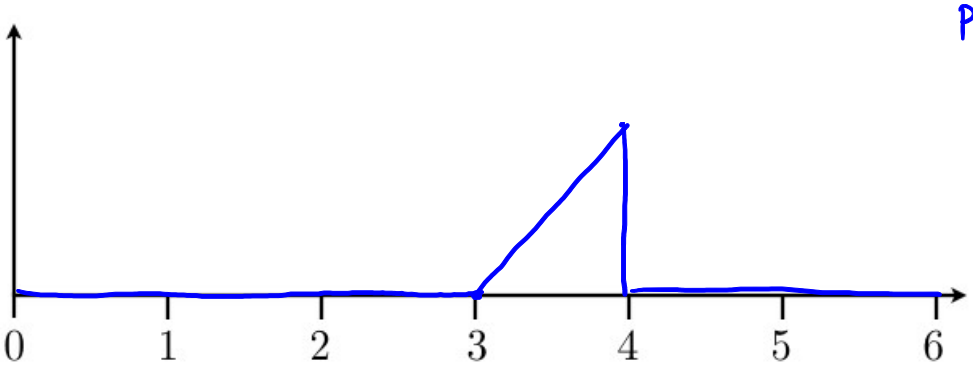
a) On the axes below, draw the snapshot graph for t = 3 s.

at t=3s, point at position x = 2m is at max displacement, and rest of pulse has already passed by.



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

pulse hits this point at t = 3s from previous graph same shape as first graph.



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