

PHYS2350 -- Fall 2024

Section 001, 002, 299

Instructor: Dr. Wolf

Best to reach on Teams, especially with quick questions

Course Structure

- We have 4 meetings per week
 - MWF 1:00pm - 1:50pm
 - Thursday 3:00pm-3:50pm OR 4:00pm-4:50pm (Unless announced otherwise)
- Each class meeting will have an assigned packet
 - Proof of previous activity completion required for entrance
 - Upload activity to Canvas by 11:59pm on class days
 - If you miss class, you should check Canvas
- Homework assignments posted to WebAssign approximately weekly, usually due Friday at 11:59pm
- Test dates are in the syllabus (Canvas)

Talk to your neighbor and be ready to share

Fill in the blank

Physics is __

Class responses:

- Motion and Energy
- The interaction between particles and energy
- Hard
- Matter and Energy
- Scary
- Curious
- Interesting
- Way easier with calculus

What do you need for the following task?

Suppose that you want to tell your partner how to get to where you live, giving detailed turn-by turn directions.

You should come up with at least 2 different items.

Class responses:

- Defined starting/stop point
- Common Reference point
- Direction Left/Right or N/S/E/W
- Way to measure distance
- Names-roads, cities, etc.
- Amount of time it takes to travel

How does this connect to describing motion?

Quantifying Motion

In order to describe the position of an object we need:

1. A reference point/origin
2. A way of describing direction/coordinate system
3. Units of length

Relating velocity and position

- Usually we write x for position and v for velocity

$$v = \frac{dx}{dt}$$

- Average velocity is similar to what you learned in 6th grade (I asked my 6th grader, and he says that he learned it at the end of 5th grade, but it was "extra" that his teacher threw in.)

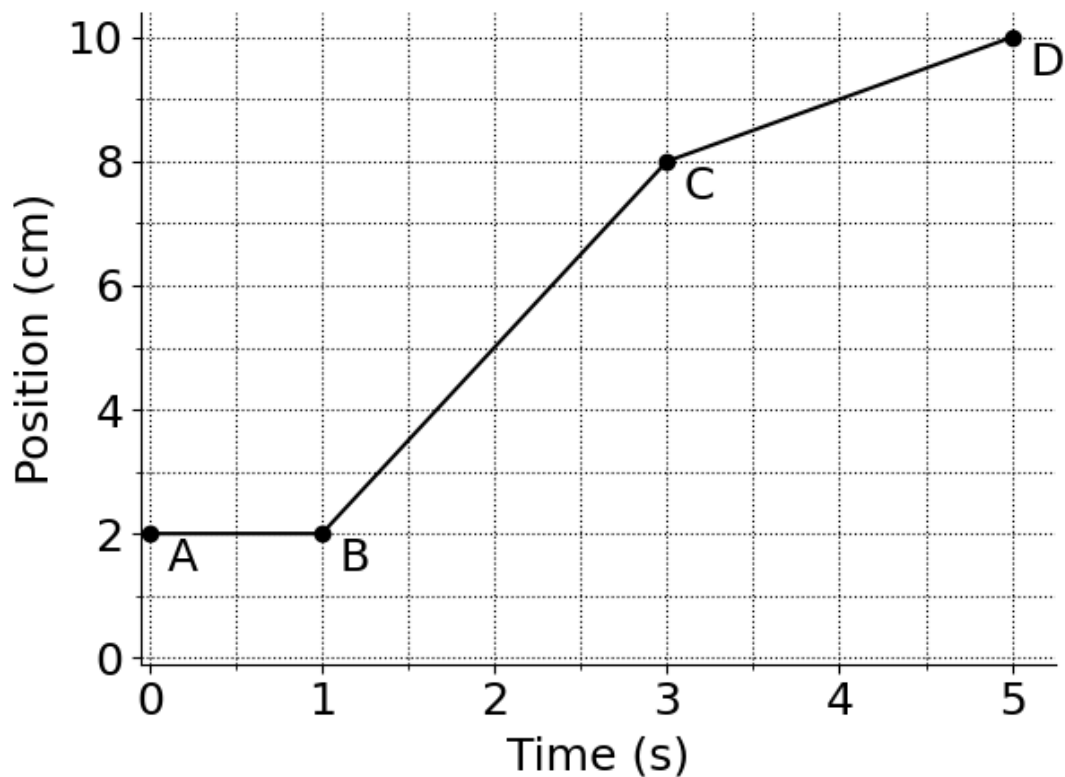
$$\bar{v}_{AB} = \frac{\Delta x_{AB}}{\Delta t_{AB}} = \frac{x_B - x_A}{t_B - t_A}$$

If we have labeled several points A and B (so t_A is the time that we pass point A, and x_A is the position of point A) and we go from point A to point B some time later.

Group Activity

Average Velocity

The position vs. time graph below represents the motion of an object moving in a straight line.



1. Describe the motion. During which time interval(s), if any, is the velocity constant?
Explain how you can tell.
2. Find the object's instantaneous velocity at each of the following times. Show your work.
 - A. $t = 0.5$ s
 - B. $t = 2.0$ s
 - C. $t = 4.0$ s
3. For each of the following intervals, find the average velocity of the object. *Hint: for average velocity, we only care about the position/time of the endpoints of the interval.*
 - A. Between A and C (Green line in plot below)
 - B. Between A and D (Blue line in plot below)
 - C. Between B and D (Yellow line in plot below)

Sketch this graph on your own, and add lines that would correspond to an object moving with constant velocity between each of the pairs of points noted above. For each line that you

drew, how does the slope compare to the average velocity that you computed above?

1. In which of the cases from problem 3, if any, is the average velocity over an interval equal to the average of the constant velocities occurring in that interval? For example, is the following expression **always** correct for any interval choice? If not, when is it true?

$$\bar{v}_{AC} = \frac{1}{2}(\bar{v}_{AB} + \bar{v}_{BC})$$

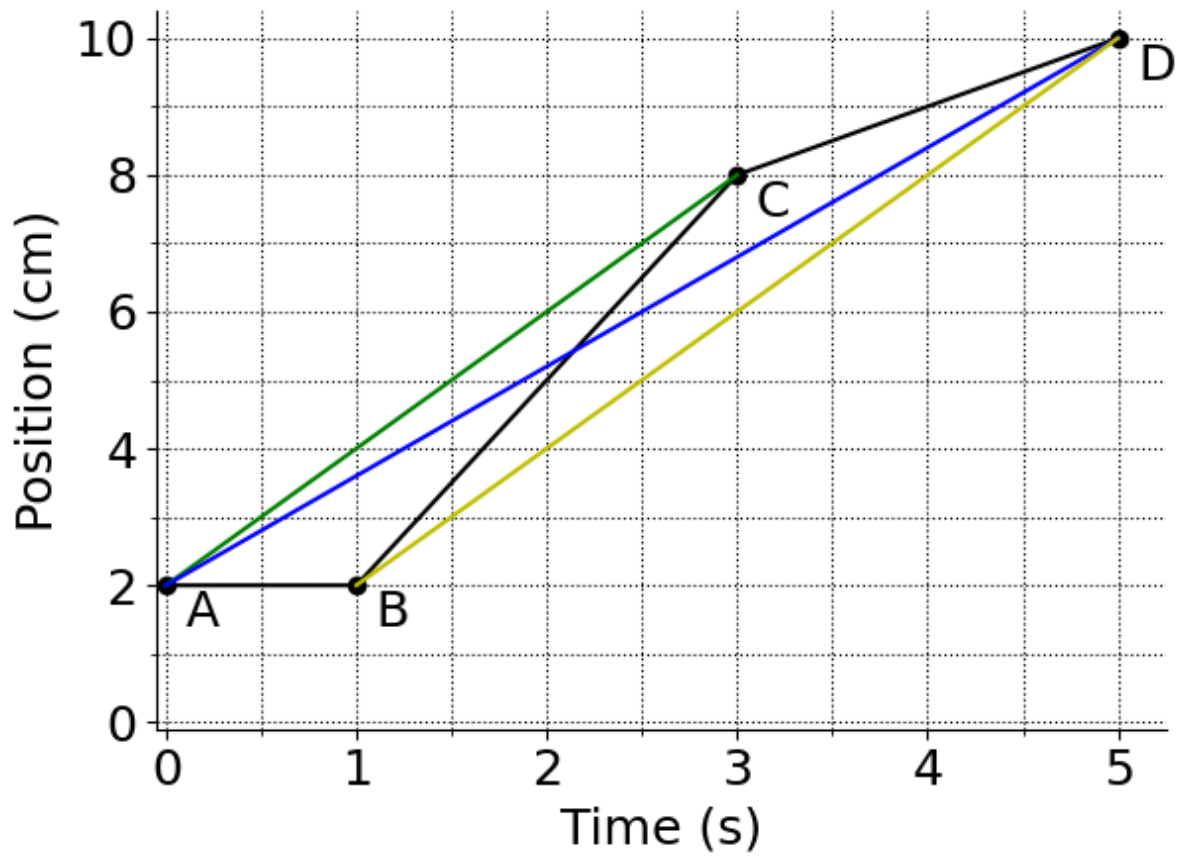
```
In [1]: %matplotlib inline

import matplotlib.pyplot as plt
import pandas as pd
import numpy as np
from thisActivity import *

plt.rcParams.update({'font.size':18})

tAC = [0, 3]
xAC = [2, 8]
tAD = [0, 5]
xAD = [2, 10]
tBD = [1, 5]
xBD = [2, 10]

fig, ax = makeMyPlot()
ax.plot(tAC,xAC,'g-')
ax.plot(tAD,xAD,'b-')
ax.plot(tBD,xBD,'y-')
plt.savefig('plotWithSecants.png')
plt.show()
```



For next time:

We will begin with problem 2, and continue with more problems.