Name: _____

Lesson 3.6b. More About Average Velocity

Date: _____ Period: _____

Something Peculiar About Average Velocity

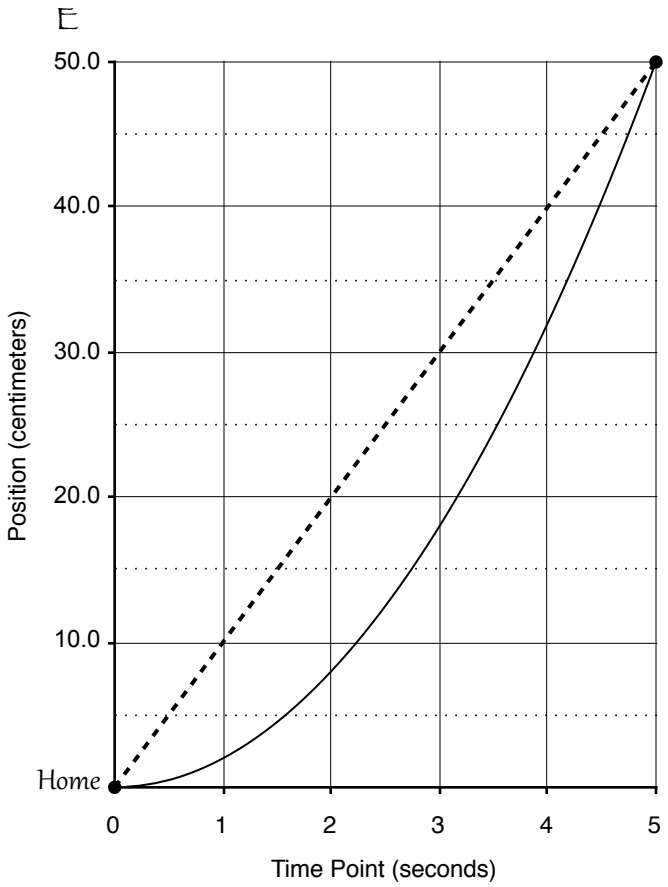
Scenario 1. Determine the average velocity of the red truck during the interval from 0 seconds to 5 seconds.

- ☐ Draw and label *blue* position arrows (or a dot) at at t_i = 0 seconds and t_f = 5 seconds.
- ☐ Draw and label a green *total displacement* arrow along with its dotted line for the interval from 0 seconds to 5 seconds.
- ☐ Calculate the average velocity during the interval from 0 seconds to 5 seconds.

_____ (formula)

_____ (calculation)

_____ (answer)



- ☐ With your regular writing pencil, draw and label a straight, dashed, *average velocity* line between the initial and final positions.
- ☐ Carefully describe the motion of the truck as represented in the position graph above.

_____

_____

_____

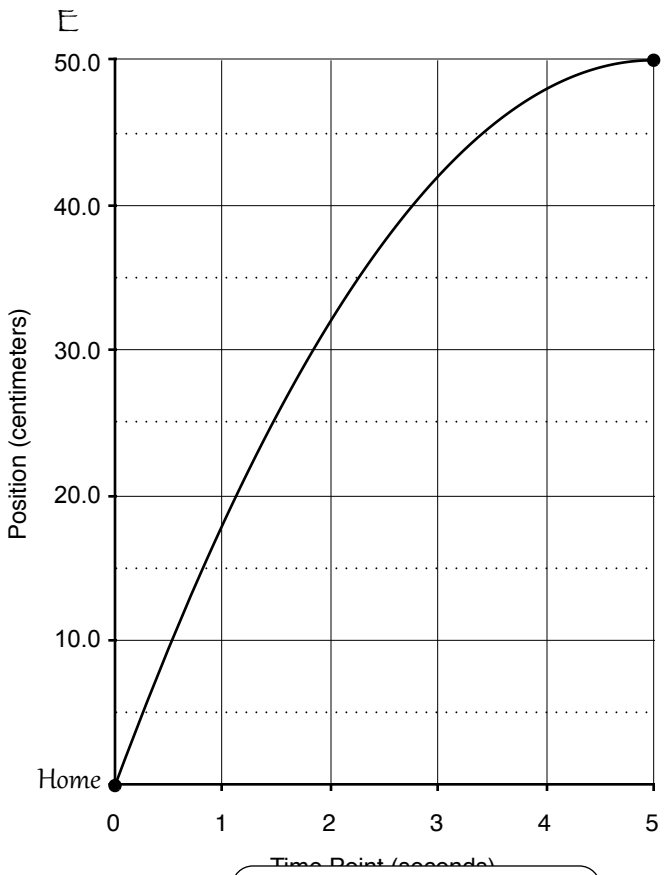
Scenario 2. Determine the average velocity of the red truck during the interval from t_i = 0 seconds to t_f = 5 seconds.

- ☐ Draw and label blue and green arrows (and dotted lines, as appropriate) as instructed on the previous page.
- ☐ Calculate the *average velocity* during the interval from 0 seconds to 5 seconds.

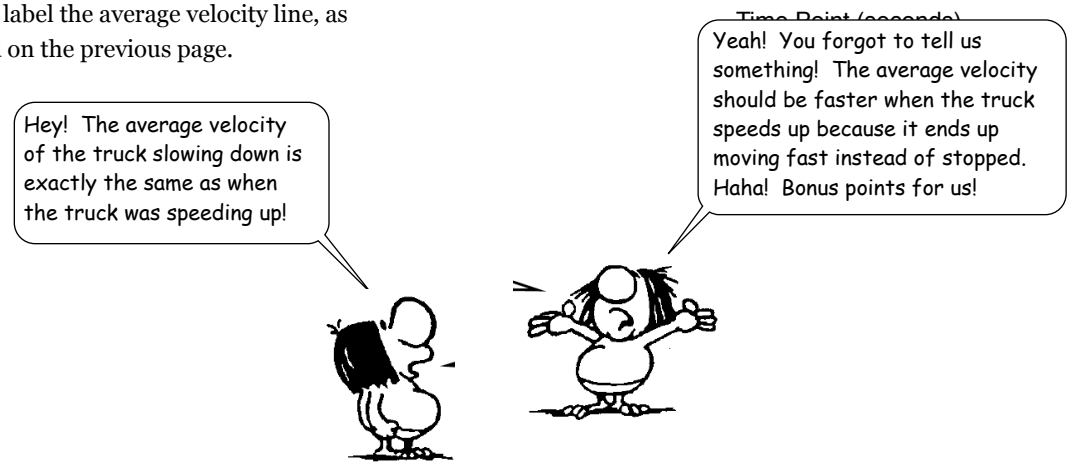
_____ (formula)

_____ (calculation)

_____ (answer)



- ☐ Draw and label the average velocity line, as instructed on the previous page.



Not so hasty, my gifted little friends.[1] I have only allowed you to discover something very peculiar about the average velocity! No matter what you do during the time interval of interest, as long as your initial and final positions are the same, then your average velocities will be the same. Even if you travel all crazy-ways, back and forth, fast and slow, upside-down and topsy-turvy, *it doesn't matter!* As long as you begin at the same position and end at the same position and finish in the same amount of time, your average velocities will be equal.

[1] All cartoon characters are from:
Buffler, Andy; Saalih, Allie; et al. Introduction to Measurement in the Physics Laboratory: A Probabilistic Approach.
University of Cape Town Department of Physics. Cape Town, South Africa. Version 3.5, 2009.
Downloaded from <www.phy.uct.ac.za/people/buffler/labmanual.html>

Another Peculiarity About Average Velocity

Scenario 3. Determine the average velocity of the red truck during the interval from 0 seconds to 5 seconds.

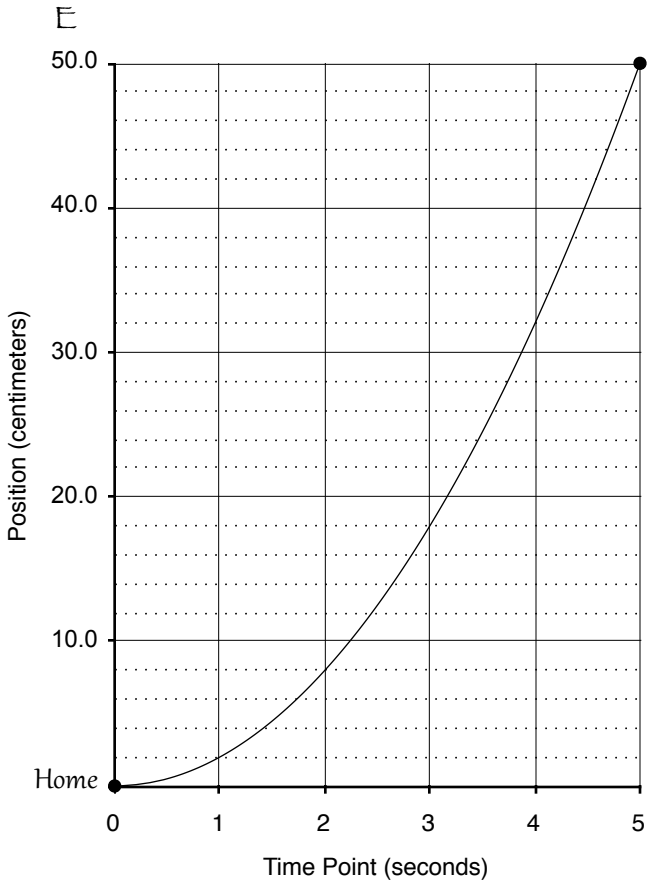
- ☐ Draw and label blue and green arrows (and dotted lines, as appropriate) as instructed in the lesson.
- ☐ Calculate the *average velocity* during the interval from 0 seconds to 5 seconds.

(formula)

(calculation)

(answer)

- ☐ Draw and label the average velocity line, as instructed in the lesson.



Scenario 4. Determine the average velocity of the red truck during the interval from 1 second to 4 seconds.

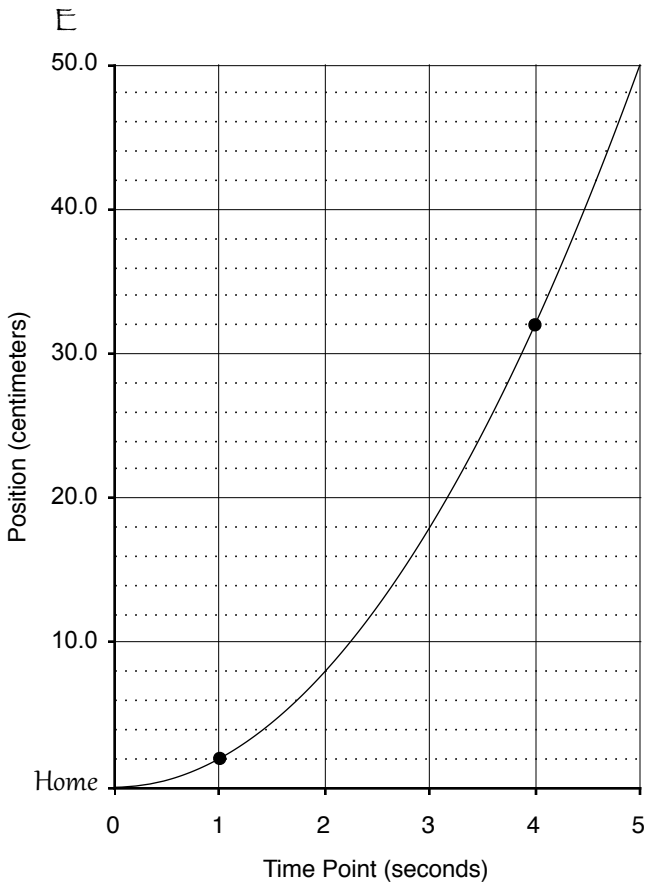
- ☐ Draw and label blue and green arrows (and dotted lines, as appropriate) as instructed in the lesson.
- ☐ Calculate the *average velocity* during the interval from 1 second to 4 seconds.

(formula)

(calculation)

(answer)

- ☐ Draw and label the average velocity line, as instructed in the lesson.



Scenario 5. Determine the average velocity of the red truck during the interval from 2 seconds to 3 seconds.

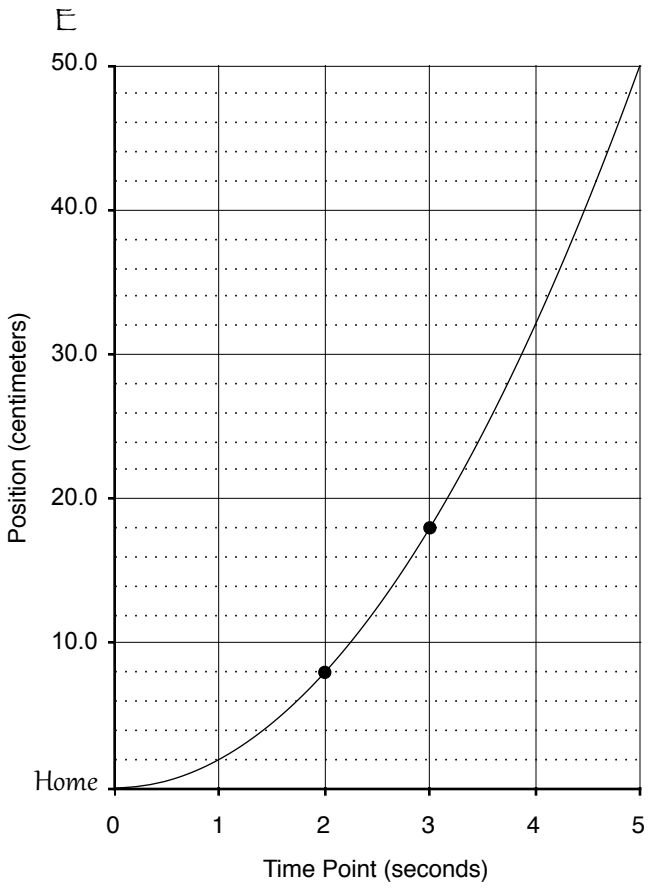
- ☐ Draw and label blue and green arrows (and dotted lines, as appropriate) as instructed in the lesson.
- ☐ Calculate the *average velocity* during the interval from 2 seconds to 3 seconds.
- ☐

(formula)

(calculation)

(answer)

- ☐ Draw and label the average velocity line, as instructed in the lesson.



Carefully study Scenarios 3, 4, and 5. Then fill in the empty cells in the table below.

Time Interval	Midpoint of Time Interval	Average Velocity
0 s → 5 s	2.5 s	
1 s → 4 s		
2 s → 3 s		

Do you notice anything? If so, please describe it! If not, then read on. However, it would be better if you tried to see the pattern by yourself, first!

Do you see that all of the time intervals have the same midpoint ***and*** the average velocities are equal? It turns out that, ***in the special case of evenly-changing velocity***, the average velocities will be equal during all intervals ***with the same midpoint in time***! This is a consequence of the *mean value theorem* of calculus, which you will learn about in the next lesson!

Name: _____

HW 3.6b. More About Average Velocity

Date: _____ Period: _____

1) Determine the average velocity of the object during the interval from t_i = 0 seconds to t_f = 4 seconds.

- ☐ Draw and label blue and green arrows (and dotted lines, as appropriate) as instructed in the lesson.
- ☐ Calculate the *average velocity* during the interval from 0 seconds to 4 seconds.

_____ (formula)

_____ (calculation)

_____ (answer)

2) Determine the average velocity of the object during the interval from t_i = 1 seconds to t_f = 3 seconds.

- ☐ Draw and label blue and green arrows (and dotted lines, as appropriate) as instructed in the lesson.
- ☐ Calculate the *average velocity* during the interval from t_i = 1 second to t_f = 3 seconds.

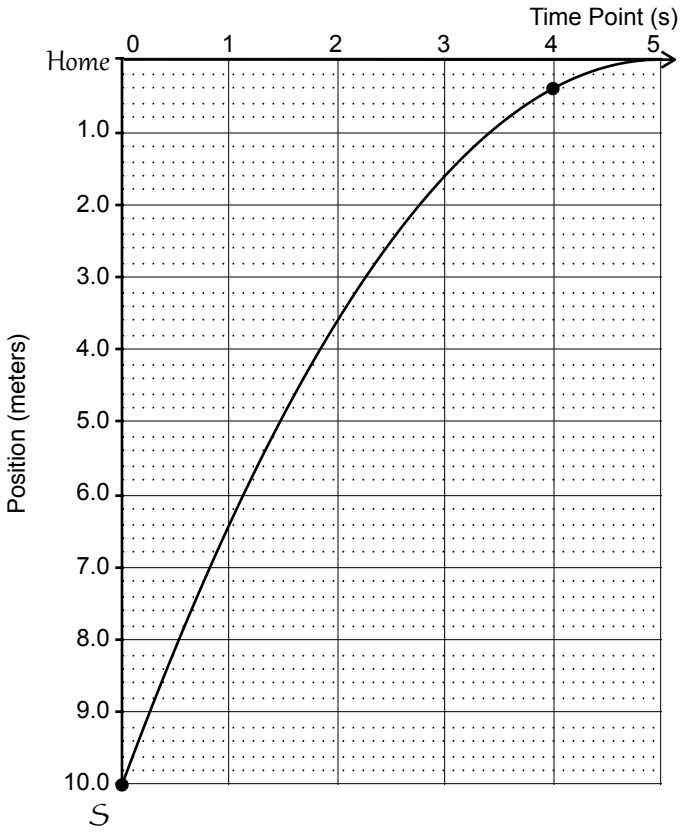
_____ (formula)

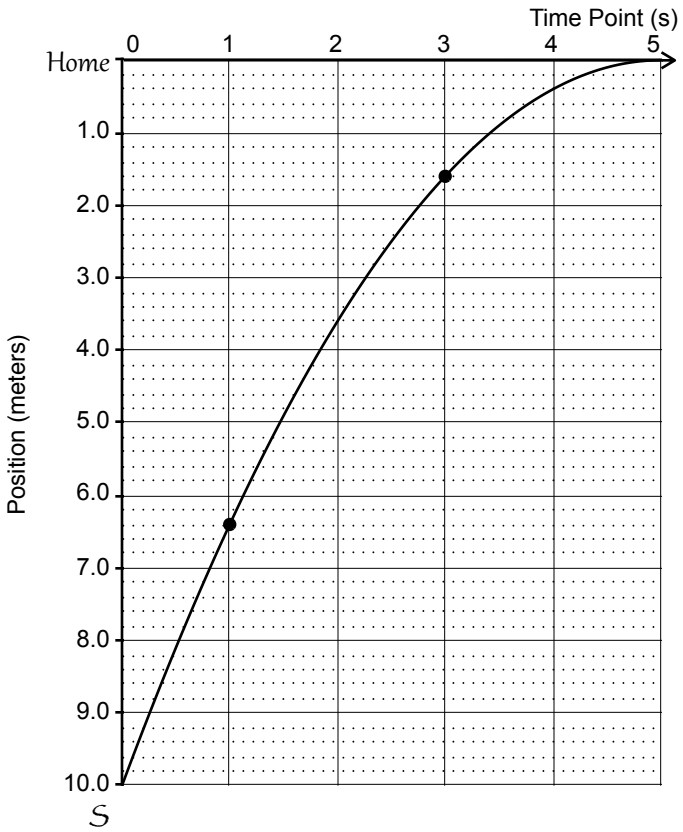
_____ (calculation)

_____ (answer)

- ☐ Draw and label the average velocity line, as instructed in the lesson.

3) Please turn the page over. The last question is on the reverse side!





Please answer the following questions neatly, in pencil. Express yourself in complete thoughts written in clear, declarative English sentences that connect the ideas in the question with the ideas in your answer. Make every pronoun refer unmistakably to a definite antecedent.

4) In this lesson, I introduced two "peculiarities" about the average velocity. Carefully describe each one.

First "peculiarity": _____

_____

_____

_____

Second "peculiarity": _____

_____

_____

_____

5) Carefully explain why it makes sense for the average velocities you calculated in questions 1 and 2 to be equal.

_____

_____

_____

_____

_____