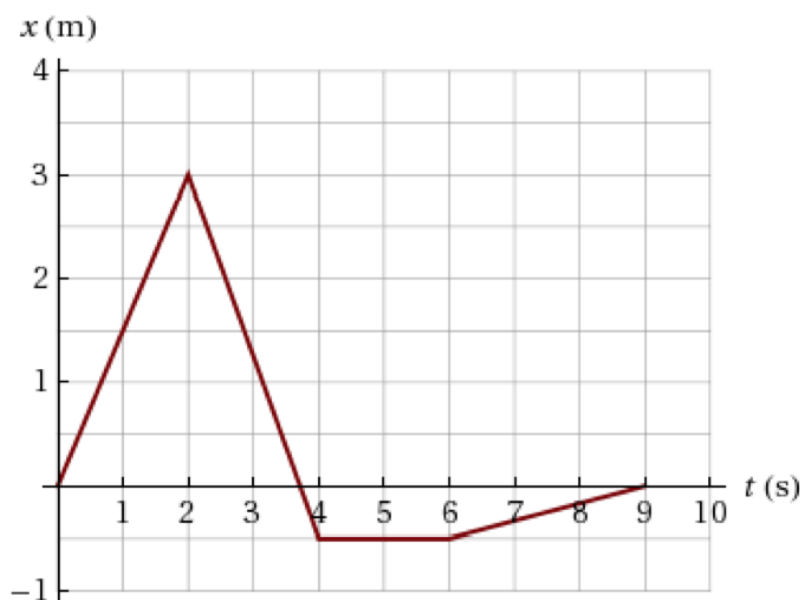


Quantitative Problems
(Given, Find, Solution REQUIRED)

1. A car travels with an average velocity of 19.25 [m/s] for 17.65 [s]. How far has the car traveled during this time?
2. Nerve impulses for pain signals in the human body travel at an approximate speed of 77 [m/s]. A 2 [m] tall man accidentally drops a hammer on his toe. How long does it take for the nerve impulse to travel from his toe to his brain?
3. The speed of light is approximately 3×10^8 [m/s]. A laser gun shoots a laser beam at a mirror 832,864 [m] away. How long will it take the beam to hit the mirror and bounce back to the laser gun?
4. The position vs. time plot for an interstellar object as it travels in a straight line is shown below. The figure below plots the object's position as a function of time. What is the average velocity of the object during the following intervals:
 - a. $0 \leq t \leq 2$ [s]
 - b. $2 \leq t \leq 4$ [s]
 - c. $4 \leq t \leq 6$ [s]
 - d. $6 \leq t \leq 9$ [s]



5. In a Gauntlet Task 1 trial, your cart is traveling away from the motion sensor at 6.56 [m/s]. When the cart is exactly 1 [m] from the sensor, the sensor's ultrasonic wave hits the cart and begins its trip back to the sensor.

In the time needed for the ultrasonic wave to travel back to the sensor to register a position value, how far from the original 1 [m] location has the cart moved? The speed of an ultrasonic wave is 343.2 [m/s].

This calculation can give you an idea of the amount of error there is in a measurement using ultrasonic motion sensors.

Qualitative Problems

**Short answer (in a complete sentence) or a fully labeled graph
(Given, Find, Solution NOT required)**

- 6. What is the main difference between a “mechanical wave” and an “electromagnetic wave”? Give an example of each.**

- 7. Sketch the “stacked” position vs. time, velocity vs. time, and acceleration vs. time graphs for an object traveling at a constant velocity. Include axes identifiers and units.**

- 8. Sketch the “stacked” position vs. time, velocity vs. time, and acceleration vs. time graphs for an object that is accelerating at a constant non-zero rate. Include axes identifiers and units.**

- 9. Give a simple definition for the physics term “force”.**

- 10. Aristotle referred to two different ways of knowing, “episteme” and “techne”. Briefly explain what each of these terms mean and how they apply to physics.**

HW Set 1 Answers

1. 339.7625 [m]

2. 0.0259 [s]

3. 0.005549 [s]

4a. 1.5 [m/s]

4b. -1.75 [m/s]

4c. 0 [m/s]

4d. 0.167 [m/s]

5. 0.0191 [m]

6-10. Will discuss in class