

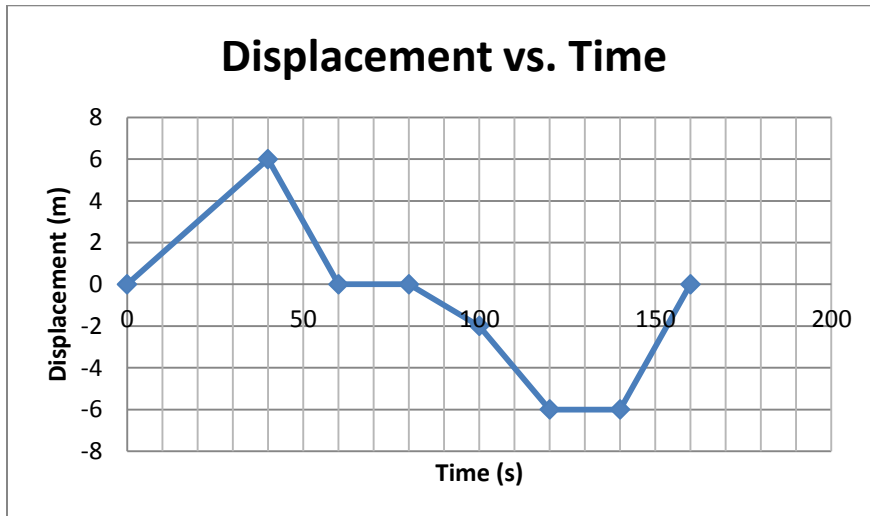
Physics Practice Problems
1-D Motion

Optional Book Work:

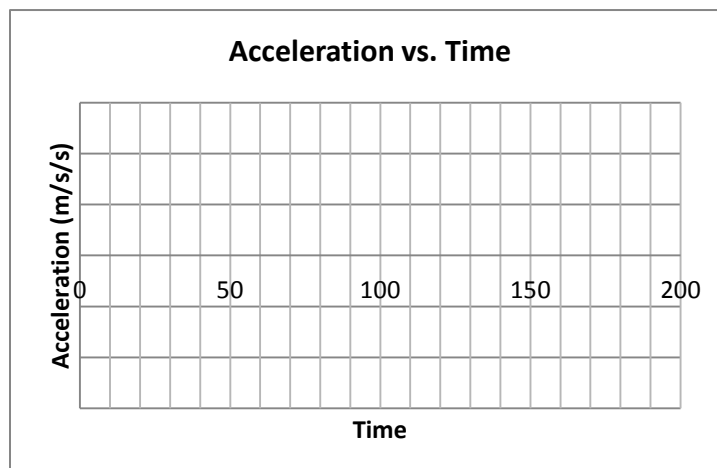
All problems are taken from the end of the chapter review in the book.
The problems begin on page 62. #3, 5-9, 13, 21-22, 26-32, 37, 39, 41-43, 54, 57

Additional Practice:

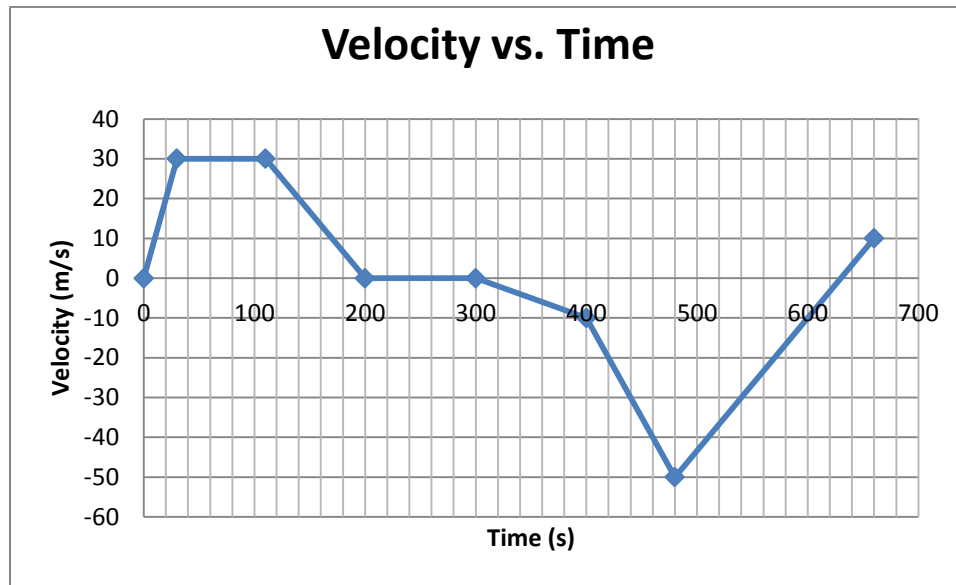
1. Use the graph below to answer questions about the motion of some mysterious object:



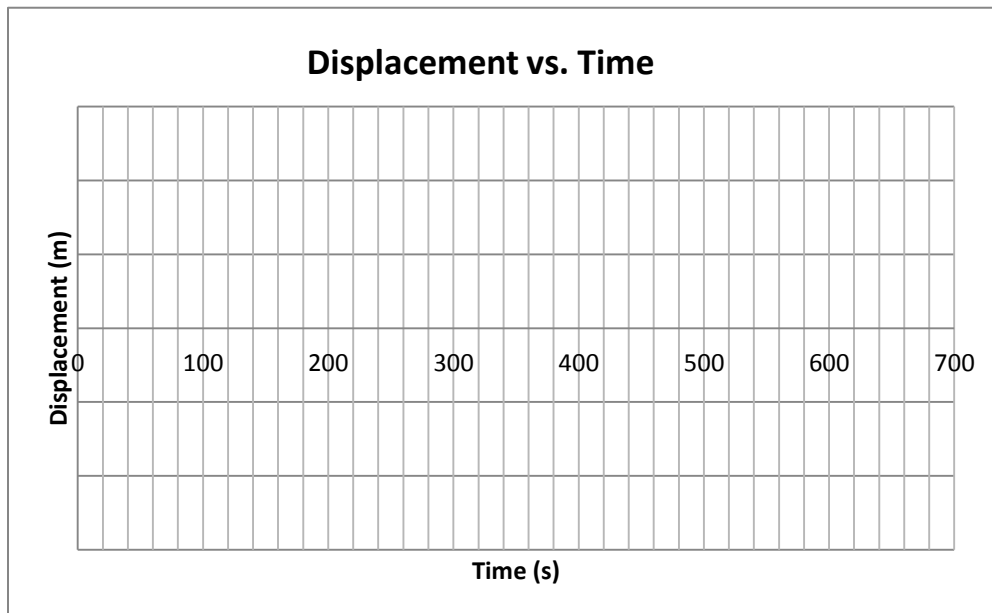
- What is the velocity of the object for the first 40 sec?
- What is the velocity of the object from 40 s -60s?
- During what time intervals is the velocity zero?
- What is the greatest velocity achieved while the object is moving forward?
- What is the greatest velocity achieved while the object is moving backwards?
- What is the displacement of the object at...
 - 40 secs?
 - 60 secs?
 - 100 secs?
 - 150 secs?
- Draw the acceleration vs. time graph for this object:



2. Use the graph below to answer questions about the motion of some mysterious object.



- a. During what time is the object's velocity zero?
- b. What is the maximum velocity of the object while travelling forwards?
- c. When is the object moving the fastest?
- d. During which time intervals is the object a speeder?
- e. During which time intervals is the object an accelerator?
- f. When during which time intervals is the object stopped?
- g. During which time interval does the object have the highest rate of acceleration?
- h. What is happening to the object during the time interval 480s-660s?
- i. Sketch the displacement vs. time graph:



3. Was Mr. Schuetz speeding?

In May of 2006, Mr. Schuetz received a letter in the mail from the Washington DC Police. Apparently he had been speeding and was caught by a camera. The posted speed was 45 mph. Using the pictures help to him determine if he deserved a ticket!

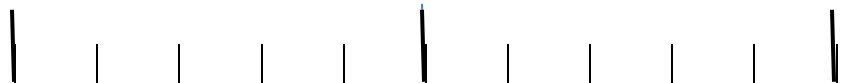
Note: - In the letter they included two pictures of his car on a marked segment of pavement.

- The images are recorded 0.2 seconds apart
- The stripes on the road surface are 5 ft apart.
- Fines are progressive. The fine is \$30 for 1-10 mph over, \$50 for 11-15 mph, \$100 for 16-20 mph and \$150 for 21-25 mph over and so on.



a. What total distance in feet did the car travel from one photo to the next?

It may be helpful to carefully mark the position of a tire in each photo on the stripes below. Remember each stripe is 5 ft past the previous stripe.



b. Knowing that the images were taken 0.2 seconds apart show your work to calculate the speed of the car in ft/s.

c. Convert your answer to mph. Remember that there are 5280 ft per mile.

d. What fine should he have gotten?

If you want to see color photos of this, go to the following website:

<https://sites.google.com/site/schuetzphysics/speeding>

4. Will Elsie, the cow, make it? Al Einstein is speeding down a country road in Palatine at a constant 32 m/s (73 mph) when he crests a hill and spots a cow (Elsie) standing in the middle of the road just 45 m in front of him. Can he stop in time to avoid hitting the cow?

The facts:

Mr. E's response time is 0.32 seconds

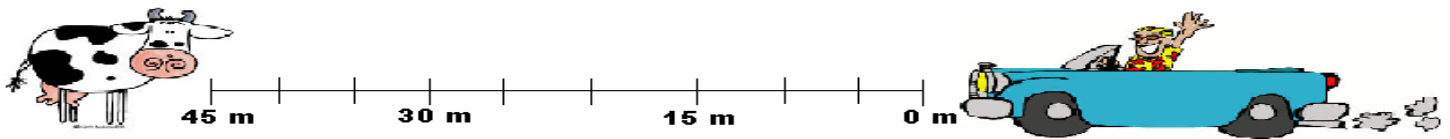
The corvette has a braking acceleration of 20 m/s/s when the brakes are applied.

- a. Calculate how far the car will travel while Al moves his foot from the gas pedal to the brake.

*Mark this distance on graphic to show far Mr. E is when his foot hits the brake.

- b. Calculate how far the car will travel while it is coming to a complete stop (stopping distance).

Below on the same diagram mark how much further the car will travel.



Did Elsie make it?

5. In a test, a car was traveling at a speed of 24.4 m/s when the driver received a signal to stop. It took 0.75s before he could apply the brake and then 4 s were required to stop the car.
- a. Draw a picture of the scenario and label the speeds at each interval. Also label whether the car was a speeder or accelerator for each motion.
- b. What is the magnitude of acceleration once the brake is applied?
- c. How far does the car travel after the driver received the signal to stop?

11. An automobile with an initial speed of 4.3 m/s accelerates uniformly at a rate of 3 m/s^2 .
- e. Find the final speed of the car after 5 seconds.

 - f. What is the displacement of the car over the course of the first 5 seconds?

 - g. How about the second five seconds (seconds 5-10)?

 - h. Why are these numbers the same or different?
12. A penny is dropped from the roof of Fremd High School. The building is approximately 45 ft tall. (Remember $1 \text{ foot} = 0.3048 \text{ meters}$)
- i. How long does it take to reach the ground?

 - j. How fast is it moving when it hits the ground?
13. A ball is thrown vertically upward.
- a. What happens to the ball's velocity while the ball is in the air?

 - b. What is its velocity when it reaches maximum altitude?

 - c. What is its acceleration when it reaches maximum altitude?

 - d. Does the acceleration increase, decrease or remain constant?
14. A juggler throws a bowling pin in the air with an initial velocity v_i . Another juggler drops a pin at the same instant. Compare their accelerations while they are in the air.
15. A worker drops a wrench from the top of a tower 80.0 m tall. What is the velocity when the wrench strikes the ground?

16. A falcon dives at a pigeon. The falcon starts downward from rest with free-fall acceleration. If the pigeon is 76.0 m below the initial position of the falcon, how long does the falcon take to reach the pigeon? Assume the pigeon stays at rest.
17. A ball is thrown vertically upward with a speed of 25.0 m/s from a height of 2.0 m.
- How long does it take to reach its highest point?
 - How long does it take for the ball to hit the ground after it reaches its highest point?

Answers can be found online at mrsgiegler.weebly.com on the Physics 432 page. Make sure to go to the 1-D Motion unit. Email or see Mrs. Giegler with any questions.