

# Kinematics Homework Problems #2

## p. 29 #49, 50, 51

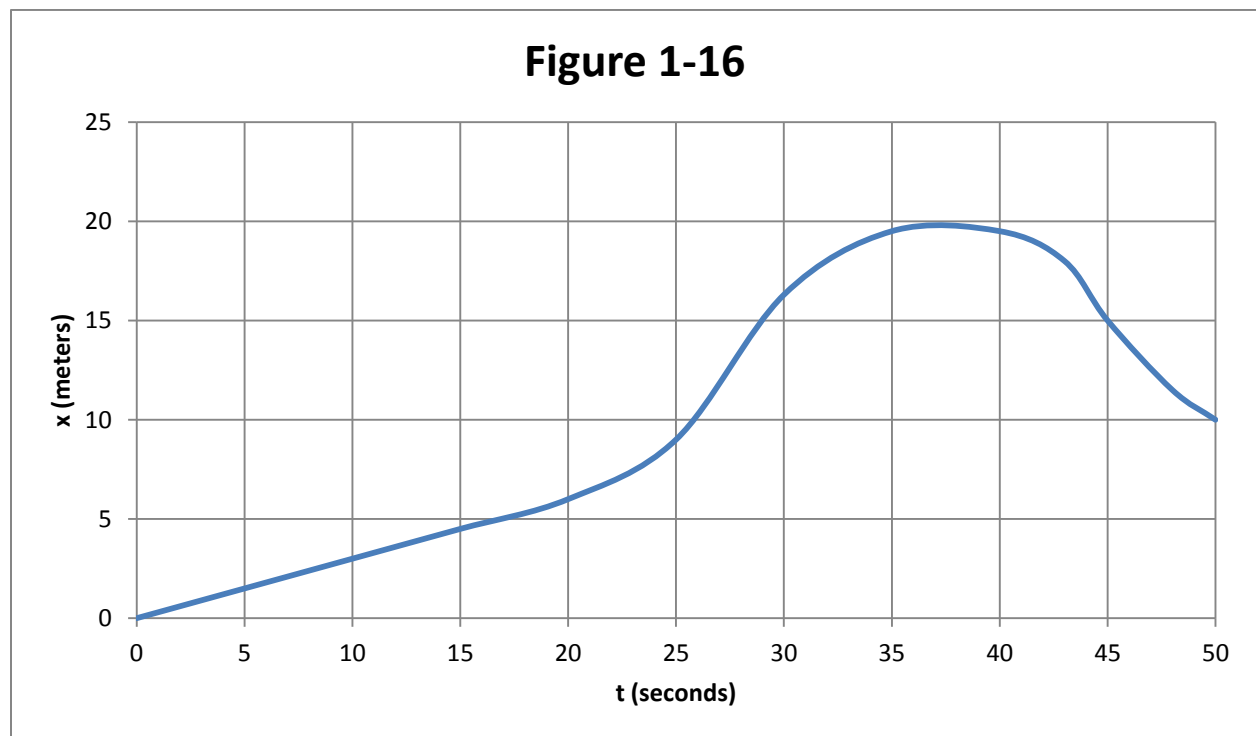
Problems taken from the school's old textbook:

Giancoli, D. (1980). *Physics*, 2<sup>nd</sup> Ed. Englewood Cliffs, NJ: Prentice Hall.

Answers are provided at the bottom of the page. Generally you don't need to print homework sheets like this one, HOWEVER, to answer questions on this particular sheet, you probably will want to print this sheet. Sketching on these graphs will aid your ability to answer these questions.

49. The position of a rabbit along a straight tunnel as a function of time is plotted in Figure 1-16. What is its

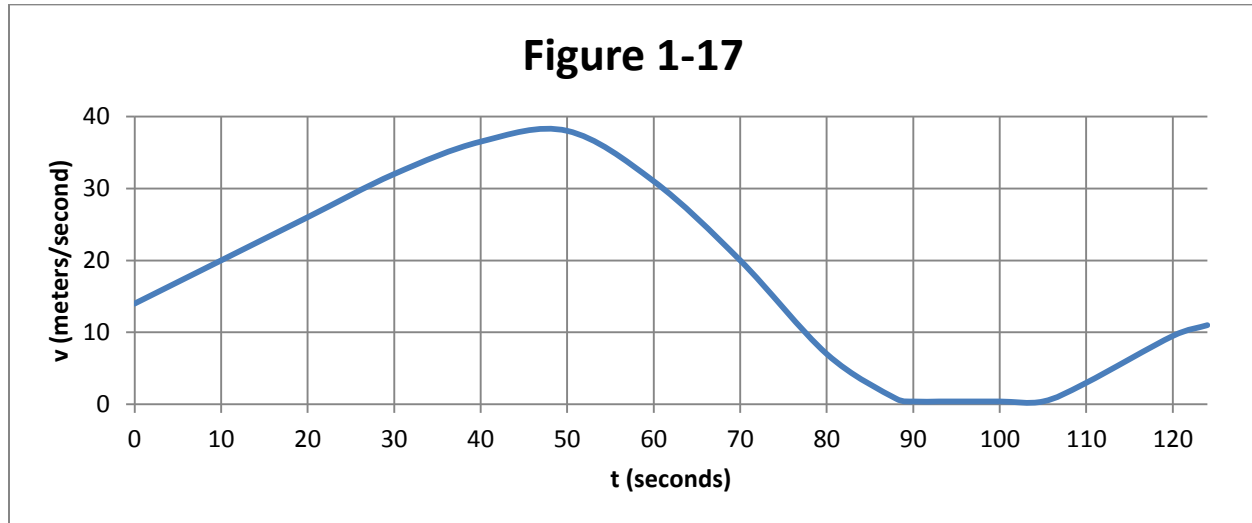
- a) Instantaneous velocity at  $t=10.0$  s?
- b) Instantaneous velocity at  $t=30.0$  s?
- c) Average velocity between  $t=0$  and  $t=5.0$  s?
- d) Average velocity between  $t=25.0$  s and  $t=30.0$  s?
- e) Average velocity between  $t=40.0$  s and  $t=50.0$  s?



50. In Figure 1-16,

- a) During what time periods, if any, is the rabbit's velocity constant?
- b) At what time is its velocity the greatest?
- c) At what time, if any, is the velocity zero?
- d) Does the rabbit run in one direction or in both along its tunnel during the time shown?

51. Figure 1-17 shows the velocity of a train as a function of time.
- At what time was its velocity greatest?
  - During what periods, if any, was the velocity constant?
  - During what periods, if any, was the acceleration constant?
  - When was the magnitude of the acceleration greatest? What was the acceleration?



**Answers:** (since we are interpreting a graph, your answers may vary slightly)

- 49a. 0.3 m/s
- 49b. 1.0 m/s
- 49c. 0.3 m/s
- 49d. 1.46 m/s
- 49e. -0.95 m/s
- 50a. Wherever the SLOPE of the graph is constant: between 0-18, 26-28 and 45-48 seconds.
- 50b. At approximately 27 seconds – where the slope of the curve is the greatest. It looks fairly steep (but in the negative direction) at 44 seconds as well.
- 50c. At 37 seconds, where the slope becomes zero.
- 50d. In both directions – it is running backwards whenever the slope of the graph is negative (between 37 and 50 seconds).
- 51a. At the highest point on the graph – at approximately 48 seconds.
- 51b. Velocity is constant whenever the slope is zero (the curve is horizontal): between 88-101 seconds.
- 51c. Acceleration is constant whenever the slope remains constant: between 0-30, 88-101, 103-120 seconds).
- 51d. The slope is steepest at approximately 75 seconds. Drawing a tangent line at 75 seconds, the slope and therefore the acceleration can be estimated to be  $-1.46 \text{ m/s}^2$