Kinematics Review Problems 2

Physics

Problems taken or adapted from the school's textbook:
Giancoli, D. (1980). *Physics*, 2nd Ed. Englewood Cliffs, NJ: Prentice Hall.

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

1. What is its instantaneous velocity at time t=25 s?
2. What is its position at time t=42 s?
3. Identify a section of the graph where acceleration is 0.

Figure 1-16

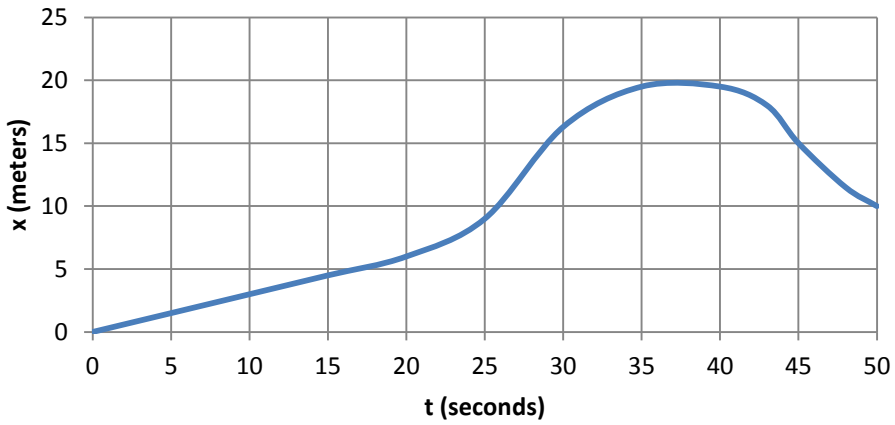
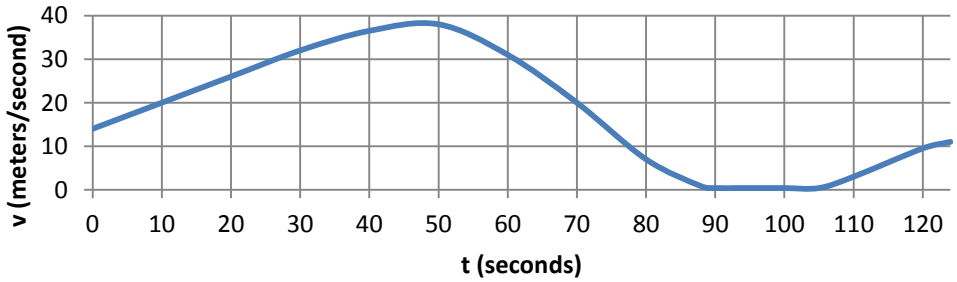


Figure 1-17 shows the velocity of a train as a function of time.

4. What is its instantaneous velocity at time t=30 s?
5. What is its instantaneous acceleration at time t=50 s?
6. What is the train's displacement between 70-110 s?
7. What is the train's position at time t=20 s? Explain your answer.

Figure 1-17



8. Police agents flying a constant 20 m/s horizontally in a helicopter wish to drop a care package into a detective's convertible traveling 7 m/s on a highway 78 meters below the helicopter. At what angle (with the horizontal) should the car be relative to the helicopter when the care package is dropped? *This is a relatively difficult problem

9. A basketball leaves a player's hands at a height of 2.1 m above the floor. The basketball player shoots the ball at a 35^{o} angle at a basket 2.6 m above the floor and 12 meters away from the player. At what velocity should the player shoot the ball? *This is a relatively difficult problem

10. An athlete throws a shotput with an initial velocity of 14 m/s at a 40^{o} angle to the horizontal. The shot leaves the shotputter's hand at a height of 2.2 m above the ground. How far does the shotput travel?

11. Suppose you adjust your garden hose nozzle for a hard stream of water. You point the nozzle vertically upward at a height of 1.5 m above the ground and wait until it hits the ground next to you. When you shut the water off, you hear the water continue to strike the ground for 2 seconds. What is the water's velocity as it leaves the nozzle? *This problem is not as hard as it seems at first glance!