

44. (III) A falling stone takes 0.28 s to travel past a window 2.2 m tall (Fig. 2–32). From what height above the top of the window did the stone fall?

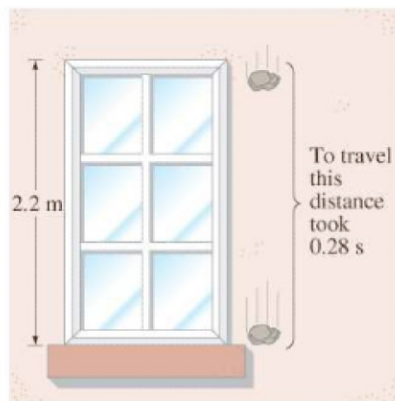


FIGURE 2–32
Problem 44.

45. (III) A rock is dropped from a sea cliff, and the sound of it striking the ocean is heard 3.2 s later. If the speed of sound is 340 m/s, how high is the cliff?
46. (III) 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 (Fig. 2–33). When you quickly move the nozzle away from the vertical, you hear the water striking the ground next to you for another 2.0 s. What is the water speed as it leaves the nozzle?

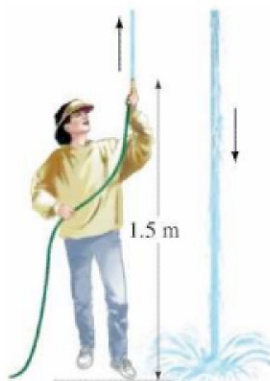


FIGURE 2–33
Problem 46.

47. (III) A stone is thrown vertically upward with a speed of 12.0 m/s from the edge of a cliff 70.0 m high (Fig. 2–34). (a) How much later does it reach the bottom of the cliff? (b) What is its speed just before hitting? (c) What total distance did it travel?

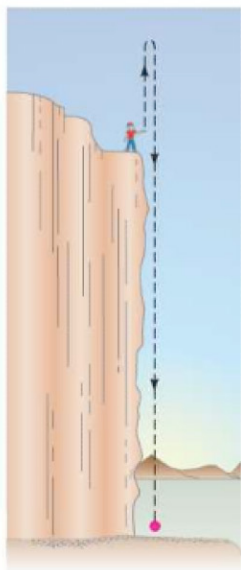


FIGURE 2–34
Problem 47.

48. (III) A baseball is seen to pass upward by a window 28 m above the street with a vertical speed of 13 m/s. If the ball was thrown from the street, (a) what was its initial speed, (b) what altitude does it reach, (c) when was it thrown, and (d) when does it reach the street again?

* 2–8 Graphical Analysis

- * 49. (I) Figure 2–29 shows the velocity of a train as a function of time. (a) At what time was its velocity greatest? (b) During what periods, if any, was the velocity constant? (c) During what periods, if any, was the acceleration constant? (d) When was the magnitude of the acceleration greatest?
- * 50. (II) The position of a rabbit along a straight tunnel as a function of time is plotted in Fig. 2–28. What is its instantaneous velocity (a) at $t = 10.0$ s and (b) at $t = 30.0$ s? What is its average velocity (c) between $t = 0$ and $t = 5.0$ s, (d) between $t = 25.0$ s and $t = 30.0$ s, and (e) between $t = 40.0$ s and $t = 50.0$ s?
- * 51. (II) In Fig. 2–28, (a) during what time periods, if any, is the velocity constant? (b) At what time is the velocity greatest? (c) At what time, if any, is the velocity zero? (d) Does the object move in one direction or in both directions during the time shown?
- * 52. (II) A certain type of automobile can accelerate approximately as shown in the velocity–time graph of Fig. 2–35. (The short flat spots in the curve represent shifting of the gears.) (a) Estimate the average acceleration of the car in second gear and in fourth gear. (b) Estimate how far the car traveled while in fourth gear.

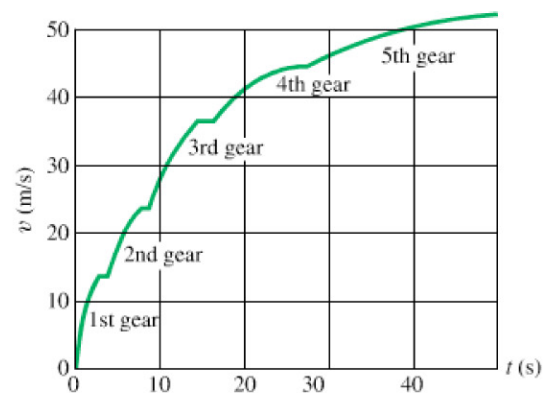


FIGURE 2–35 Problems 52 and 53. The velocity of an automobile as a function of time, starting from a dead stop. The jumps in the curve represent gear shifts.

- * 53. (II) Estimate the average acceleration of the car in the previous Problem (Fig. 2–35) when it is in (a) first, (b) third, and (c) fifth gear. (d) What is its average acceleration through the first four gears?
- * 54. (II) In Fig. 2–29, estimate the distance the object traveled during (a) the first minute, and (b) the second minute.
- * 55. (II) Construct the v vs. t graph for the object whose displacement as a function of time is given by Fig. 2–28.