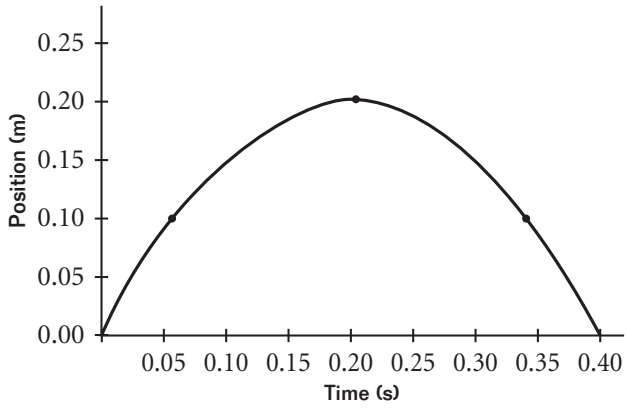
34. A ball is thrown directly upward into the air. The graph below shows the vertical position of the ball with respect to time.

a. How much time does the ball take to reach its maximum height?

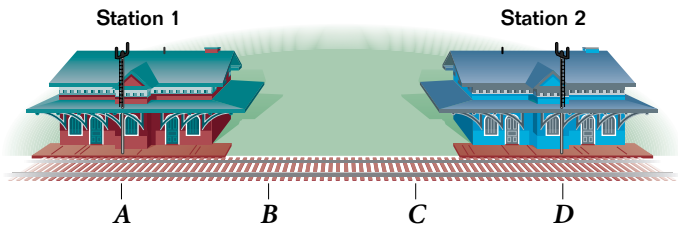
b. How much time does the ball take to reach one-half its maximum height?

c. Estimate the slope of $\Delta y/\Delta t$ at $t = 0.05$ s, $t = 0.10$ s, $t = 0.15$ s, and $t = 0.20$ s. On your paper, draw a coordinate system with velocity (v) on the y-axis and time (t) on the x-axis. Plot your velocity estimates against time.

d. From your graph, determine what the acceleration on the ball is.



35. A train travels between stations 1 and 2, as shown below. The engineer of the train is instructed to start from rest at station 1 and accelerate uniformly between points *A* and *B*, then coast with a uniform velocity between points *B* and *C*, and finally accelerate uniformly between points *C* and *D* until the train stops at station 2. The distances *AB*, *BC*, and *CD* are all equal, and it takes 5.00 min to travel between the two stations. Assume that the uniform accelerations have the same magnitude, even when they are opposite in direction.



a. How much of this 5.00 min period does the train spend between points *A* and *B*?

b. How much of this 5.00 min period does the train spend between points *B* and *C*?

c. How much of this 5.00 min period does the train spend between points *C* and *D*?

36. Two students are on a balcony 19.6 m above the street. One student throws a ball vertically downward at 14.7 m/s. At the same instant, the other student throws a ball vertically upward at the same speed. The second ball just misses the balcony on the way down.

a. What is the difference in the time the balls spend in the air?

b. What is the velocity of each ball as it strikes the ground?

c. How far apart are the balls 0.800 s after they are thrown?

37. A rocket moves upward, starting from rest with an acceleration of +29.4 m/s^2 for 3.98 s. It runs out of fuel at the end of the 3.98 s but does not stop. How high does it rise above the ground?

38. Two cars travel westward along a straight highway, one at a constant velocity of 85 km/h, and the other at a constant velocity of 115 km/h.

a. Assuming that both cars start at the same point, how much sooner does the faster car arrive at a destination 16 km away?

b. How far must the cars travel for the faster car to arrive 15 min before the slower car?

39. A small first-aid kit is dropped by a rock climber who is descending steadily at 1.3 m/s. After 2.5 s, what is the velocity of the first-aid kit, and how far is the kit below the climber?

40. A small fish is dropped by a pelican that is rising steadily at 0.50 m/s.

a. After 2.5 s, what is the velocity of the fish?

b. How far below the pelican is the fish after 2.5 s?

41. A ranger in a national park is driving at 56 km/h when a deer jumps onto the road 65 m ahead of the vehicle. After a reaction time of t s, the ranger applies the brakes to produce an acceleration of –3.0 m/s^2. What is the maximum reaction time allowed if the ranger is to avoid hitting the deer?