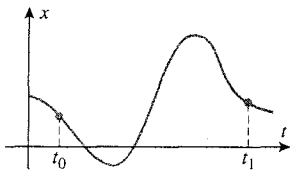

Figure Ex-3

4. For the graphs in the accompanying figure, match the position functions with their corresponding velocity functions.

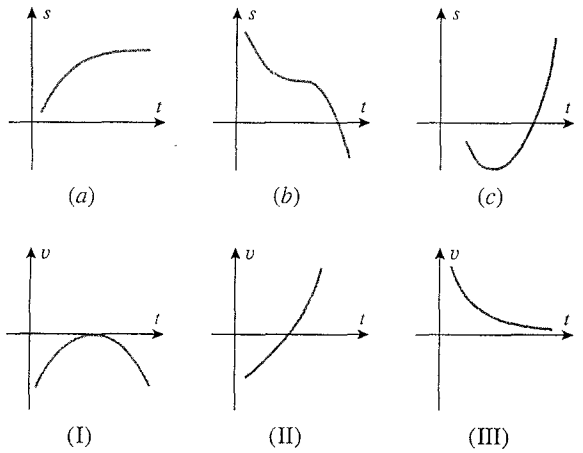

Figure Ex-4

5. Sketch a reasonable graph of s versus t for a mouse that is trapped in a narrow corridor (an s-axis with the positive direction to the right) and scurries back and forth as follows. It runs right with a constant speed of 1.2 m/s for awhile, then gradually slows down to 0.6 m/s, then quickly speeds up to 2.0 m/s, then gradually slows to a stop but immediately reverses direction and quickly speeds up to 1.2 m/s.

6. The accompanying figure shows the graph of s versus t for an ant that moves along a narrow vertical pipe (an s-axis with the positive direction up).
(a) When, if ever, is the ant above the origin?
(b) When, if ever, does the ant have velocity zero?
(c) When, if ever, is the ant moving down the pipe?

7. The accompanying figure shows the graph of velocity versus time for a particle moving along a coordinate line. Make a rough sketch of the graphs of speed versus time and acceleration versus time.

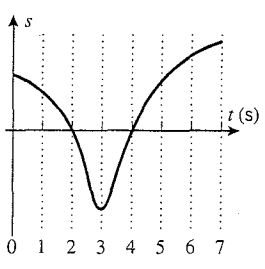

Figure Ex-6

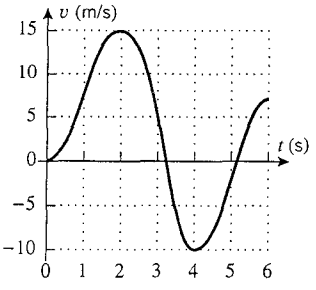

Figure Ex-7

8. The accompanying figure shows the position versus time graph for an elevator that ascends 40 m from one stop to the next.
(a) Estimate the velocity when the elevator is halfway up.
(b) Sketch rough graphs of the velocity versus time curve and the acceleration versus time curve.

9. The accompanying figure shows the velocity versus time graph for a test run on a classic Grand Prix GTP. Using this graph, estimate
(a) the acceleration at 60 mi/h (in units of ft/s^2)
(b) the time at which the maximum acceleration occurs.
[Data from *Car and Driver Magazine*, October 1990.]

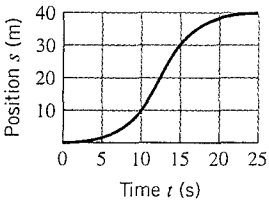

Figure Ex-8

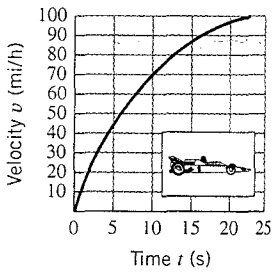

Figure Ex-9

10. Let $s(t) = \sin(\pi t/4)$ be the position function of a particle moving along a coordinate line, where s is in meters and t is in seconds.
(a) Make a table showing the position, velocity, and acceleration to two decimal places at times $t = 1, 2, 3, 4$, and 5.
(b) At each of the times in part (a), determine whether the particle is stopped; if it is not, state its direction of motion.
(c) At each of the times in part (a), determine whether the particle is speeding up, slowing down, or neither.

In Exercises 11–14, the position function of a particle moving along a coordinate line is given, where s is in feet and t is in seconds.
(a) Find the velocity and acceleration functions.
(b) Find the position, velocity, speed, and acceleration at time $t = 1$.
(c) At what times is the particle stopped?
(d) When is the particle speeding up? Slowing down?
(e) Find the total distance traveled by the particle from time $t = 0$ to time $t = 5$.

11. $s(t) = t^3 - 6t^2, \quad t \geq 0$

12. $s(t) = t^4 - 4t + 2, \quad t \geq 0$

13. $s(t) = 3\cos(\pi t/2), \quad 0 \leq t \leq 5$

14. $s(t) = \dfrac{t}{t^2 + 4}, \quad t \geq 0$

15. Let $s(t) = t/(t^2 + 5)$ be the position function of a particle moving along a coordinate line, where s is in meters and t is in seconds. Use a graphing utility to generate the graphs of $s(t)$, $v(t)$, and $a(t)$ for $t \geq 0$, and use those graphs where needed.