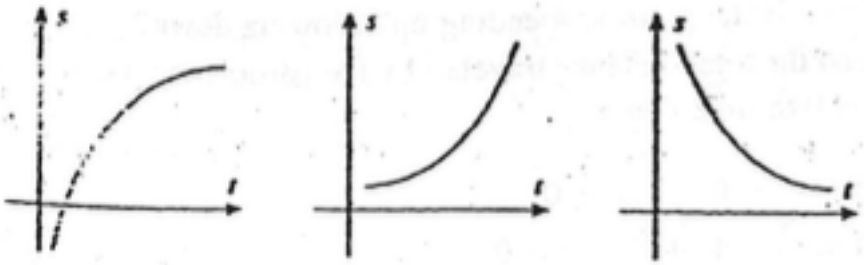
Ch 5 P2 - 5.3 PVA Practice WS

1. The graphs of three position functions are shown in the accompanying figure. In each case determine the signs of the velocity and acceleration, then determine whether the particle is speeding up or slowing down.



2. The position function of a particle moving on a horizontal x-axis is shown in Figure Ex-3
   (a) Is the particle moving left or right at time t_0?
   (b) Is the acceleration positive or negative at time t_0?
   (c) Is the particle speeding up or slowing down at time t_0?
   (d) Is the particle speeding up or slowing down at time t_1?

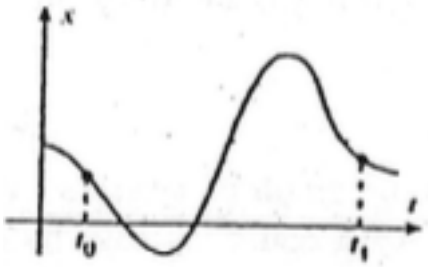
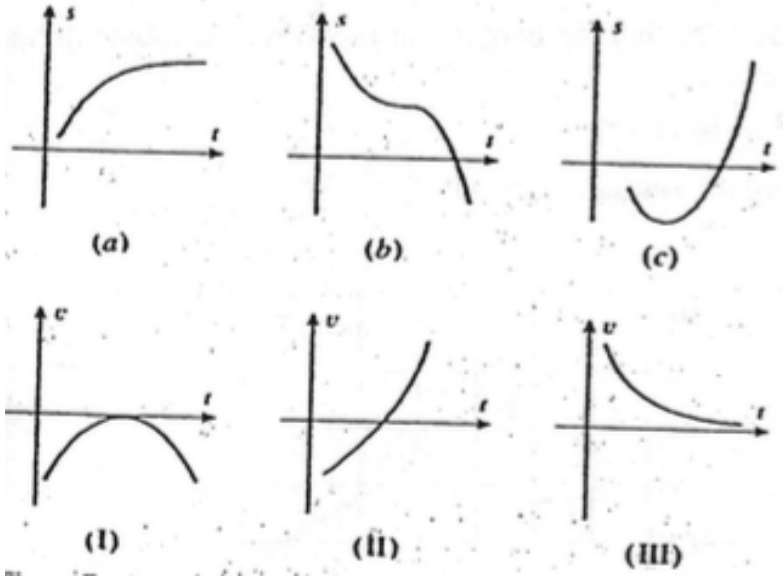


Figure Ex-3

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



4. 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?

5. 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.

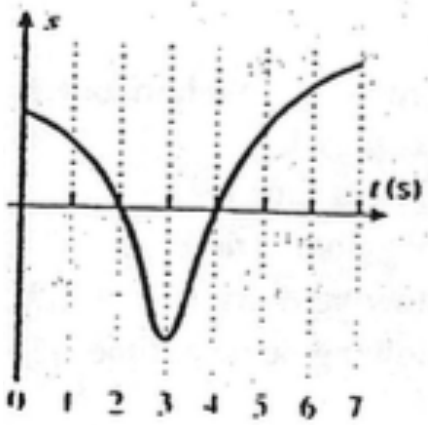


Figure Ex-6

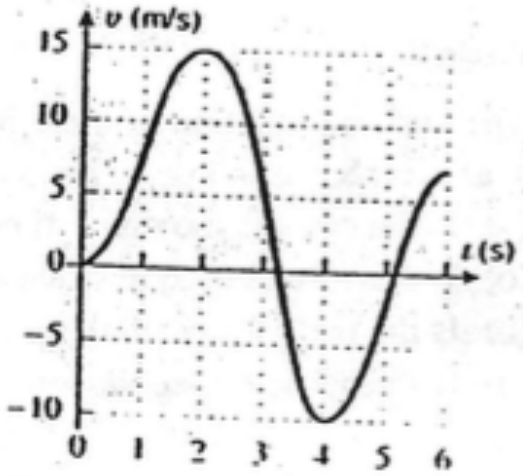


Figure Ex-7

6. A particle is moving along the x-axis. Its position at time t, is given by the equation:

$$s(t) = \frac{t^4}{4} - \frac{7t^3}{3} + 5t^2$$

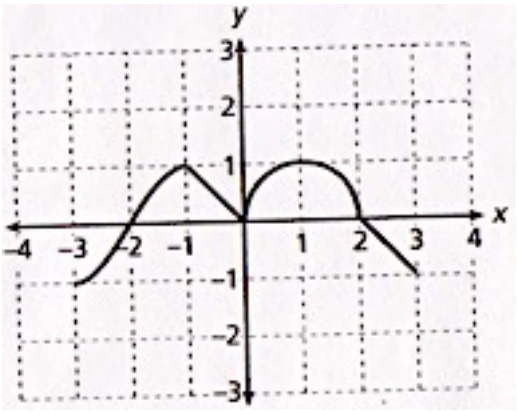
a. What is the velocity of the particle at $t = 3$? Is the velocity increasing or decreasing at this time? Explain and justify your answer.

b. At what values of t does the particle change direction? Explain and justify your answer.

c. For which values of t is the position graph concave downwards? For which values is it concave upwards? Explain and justify your answer.

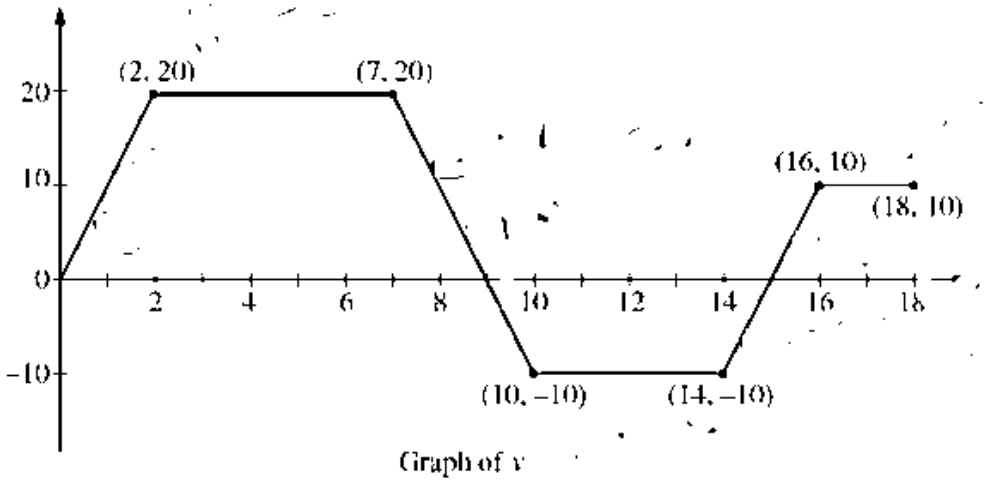
d. For which values of t is the particle speeding up? For which values is it slowing down? Explain and justify your answer.

7. The graph of $f'(x)$ is given below for $x \in [-3, 3]$. On which interval(s) is the function $f(x)$ both increasing and concave up?



(A) $(-2,2)$
(B) $(-2,0) \cup (0,2)$
(C) $(-3,-2)$
(D) $(-2,-1) \cup (0,1)$
(E) none of these

8. A graph of $v(t)$ is provided. When does the particle stop and change direction?



Graph of v

9. Car *A* has positive velocity $v(t)$ as it travels on a straight road. Where *v* is a differentiable function of *t.* The velocity is recorded for selected values over the time interval $0 \leq t \leq 10$ seconds, as shown in the table below. Use the data from the table to approximate the acceleration of Car *A* at *t* = 8 seconds. Indicate units of measure.

t (sec)	0	2	5	7	10
$v(t)$ (ft/sec)	0	9	36	61	115

10. A particle moves along the y-axis for $0 \leq t \leq 40$ seconds. The velocity of the particle at time t is given by $v(t) = \sin\left(\frac{\pi}{8}t\right)$ in meters/second. The particle is at position y = 10 meters at time t = 0. Find the acceleration of the particle at time t. Is the speed of the particle increasing, decreasing, or neither at time t = 10 seconds?

11. Use $P(t) = t^3 - t^2 - t$

a. Find initial position and Initial motion.

b. When does the particle change direction?

c. Is the velocity increasing or decreasing at t = 4?

d. When is the particle speeding up, slowing down?

For Numbers 12-14: 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?

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

13. $s(t) = 3\cos\left(\frac{\pi}{2}t\right), 0 \leq t \leq 5$

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