

PVA / Motion Practice

1. A particle moves along the x -axis so that at any time $t \geq 0$, its position is given by $x(t) = -\frac{1}{2} \cos t - 3t$.
What is the acceleration of the particle when $t = \frac{\pi}{3}$?

(A) $-\frac{\sqrt{3}}{4}$ (B) $-\frac{1}{4}$ (C) $\frac{1}{4}$ (D) $\frac{\sqrt{3}}{4}$

2. A point moves along the x -axis so that at any time t , its position is given by $x(t) = \sqrt{x \ln x}$. For what values of t is the particle at rest?

(A) No values (B) $\frac{1}{e^2}$ (C) $\frac{1}{e}$ (D) e

3. A particle moves along the x -axis so that at any time t , its position is given by $x(t) = 3 \sin t + t^2 + 7$.
What is velocity of the particle when its acceleration is zero?

(A) 1.504 (B) 1.847 (C) 2.965 (D) 3.696

4. Two particles start at the origin and move along the x -axis. For $0 \leq t \leq 8$, their respective position functions are given by $x_1(t) = \sin^2 t$ and $x_2(t) = e^{-t}$. For how many values of t do the particles have the same velocity?

(A) 3 (B) 4 (C) 5 (D) 6

5. A particle moves along a line so that at time t , where $0 \leq t \leq 5$, its velocity is given by $v(t) = -t^3 + 6t^2 - 15t + 10$. What is the minimum acceleration of the particle on the interval?

(A) -30 (B) -15 (C) -3 (D) 0

6. The position of a particle moving along a line is given by $s(t) = t^3 - 12t^2 + 21t + 10$ for $t \geq 0$. For what value of t is the speed of the particle increasing?

(A) $1 < t < 7$ only (C) $0 < t < 1$ and $4 < t < 7$
(B) $4 < t < 7$ only (D) $1 < t < 4$ and $t > 7$

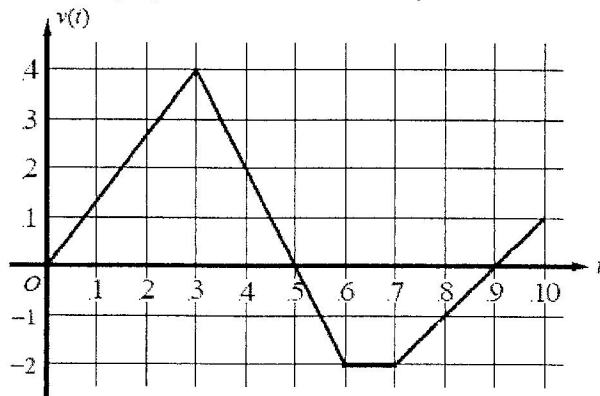
7. The acceleration of a particle moving along the x -axis at time t is given by $a(t) = 2t - 6$.
If at $t = 1$, the velocity of the particle is 3 and its position is $\frac{1}{3}$, then the position $x(t) =$

(A) $\frac{t^3}{3} - 6t^2 + 5t + \frac{1}{3}$ (C) $\frac{t^3}{3} - 6t + 9$
(B) $\frac{t^3}{3} - 3t^2 + 8t - 5$ (D) $\frac{t^3}{3} - 3t^2 + 8t - \frac{7}{3}$

8. The velocity of a particle moving along the x -axis at any time t is given by $v(t) = 3e^{-t} - t$.
What is the average speed of the particle over the time interval $0 \leq t \leq 3$?
- (A) 0.873 (B) 1.096 (C) 1.273 (D) 1.482

9. A particle travels along a straight line with a velocity of $v(t) = e^t(t^2 - 5t + 6)$ meters per second.
What is the average velocity of the particle over the time interval $0 \leq t \leq 5$?
- (A) 58.602 (B) 64.206 (C) 79.351 (D) 86.448

Use the graph below to answer questions 10-14:



10. A particle is moving along the x -axis. The velocity v of the particle at time t , $0 \leq t \leq 10$, is given by the function whose graph is shown above.
At what value(s) of t does the particle change direction?
- (A) 3 only (B) 3 and 6 (C) 5 and 9 (D) 6 and 7
11. What is the total distance traveled by the particle over the time interval $0 \leq t \leq 10$?
- (A) 15.5 (B) 12 (C) 9.5 (D) 8
12. At what time t during the time interval $0 \leq t \leq 10$ is the particle farthest to the right?
- (A) 3 (B) 5 (C) 7 (D) 9
13. What is the velocity of the particle at time $t = 4$?
- (A) -2 (B) 2 (C) 5 (D) 7
14. What is the acceleration of the particle at time $t = 4$?
- (A) -2 (B) 2 (C) 5 (D) 7