

1. A particle moves along the x -axis so that its position at time t is given by $x(t) = t^2 - 6t + 5$. For what value of t is the velocity of the particle zero?
- (A) 1 (B) 2 (C) 3 (D) 4 (E) 5
2. The maximum acceleration attained on the interval $0 \leq t \leq 3$ by the particle whose velocity is given by $v(t) = t^3 - 3t^2 + 12t + 4$ is
- (A) 9 (B) 12 (C) 14 (D) 21 (E) 40
3. A particle's position is given by $s = t^3 - 6t^2 + 9t$. What is its acceleration at time $t = 4$?
- (A) 0
(B) 9
(C) -9
(D) -12
(E) 12
4. A particle moves along the y -axis so that its position at any time t , for $0 \leq t \leq 5$, is given by $y(t) = t^4 - 18t^2$. In which interval(s) is the particle speeding up?
- (A) $0 < t < \sqrt{3}$
(B) $0 < t < \sqrt{3}$ and $3 < t < 5$
(C) $3 < t < 5$
(D) $\sqrt{3} < t < 3$ and $3 < t < 5$
(E) $\sqrt{3} < t < 3$

Calculator

5. A particle moves along the y -axis so that its velocity at any time $t \geq 0$ is given by $v(t) = t \cos t$.
- For what values of t , $0 \leq t \leq 5$, is the particle moving upward?
 - Write an expression for the acceleration of the particle in terms of t .
 - For $t > 0$, find the acceleration of the particle the first time the velocity of the particle is zero.
 - Is the speed of the particle increasing or decreasing at $t = 2.3$?

No Calculator

6. An object moves along the x -axis. The velocity of the object at $t \geq 0$ is given by $v(t) = \sin\left(\frac{\pi}{3}t\right)$.
- What is the acceleration of the object at time $t = 4$?
 - Consider the following two statements.
Statement I: For $3 < t < 4.5$, the velocity of the object is decreasing.
Statement II: For $3 < t < 4.5$, the speed of the object is increasing.
Are either or both of these statements correct? For each statement provide a reason why it is correct or not correct.
 - At what times t , if any, in the interval $0 < t < 6$ is the object changing direction. Give reason for your answer.

Calculator

7. A particle moves along the x -axis so that its velocity at time t is given by

$$v(t) = -(t + 1)\sin\left(\frac{t^2}{2}\right).$$

- Find the acceleration of the particle at time $t = 2$.
- Is the speed of the particle increasing at $t = 2$? Give reason for your answer.
- Find all times t in the open interval $0 < t < 3$ when the particle changes direction. Justify your answer.

Calculator

8. For $t \geq 0$, a particle moves along the x -axis with a velocity given by $v(t) = 2t - 5 \sin \pi t$.
At $t = 0$, the particle is located at $x = 0$
- Write an expression for the acceleration $a(t)$ of the particle.
 - For what values of t ($t \geq 0$) is the particle moving to the left?