

Particle Motion #1

A particle moves along a horizontal line. Its position function is $s(t)$ for $t \geq 0$. For each problem, find the times t when the particle changes directions.

1) $s(t) = t^3 - 12t^2$

2) $s(t) = -t^3 + 4t^2 + 60t$

3) $s(t) = -t^3 + 11t^2 - 24t$

4) $s(t) = -t^4 + 14t^3$

A particle moves along a horizontal line. Its position function is $s(t)$ for $t \geq 0$. For each problem, find the intervals of time when the particle is moving left and moving right.

5) $s(t) = -t^3 + 15t^2$

6) $s(t) = t^3 - 22t^2 + 121t$

7) $s(t) = t^3 - 23t^2 + 120t$

8) $s(t) = t^3 - 10t^2$

A particle moves along a horizontal line. Its position function is $s(t)$ for $t \geq 0$. For each problem, find the velocity and acceleration at the given value for t .

9) $s(t) = -t^3 + 14t^2$; at $t = 3$

10) $s(t) = -t^3 + 4t^2 + 60t$; at $t = 6$

11) $s(t) = -t^3 + t^2 + 56t$; at $t = 4$

12) $s(t) = t^3 - 11t^2$; at $t = 2$

Answers to Particle Motion #1

- 1) Changes direction at: $t = \{8\}$ 2) Changes direction at: $t = \{6\}$
3) Changes direction at: $t = \left\{\frac{4}{3}, 6\right\}$ 4) Changes direction at: $t = \left\{\frac{21}{2}\right\}$
5) Moving left: $t > 10$, Moving right: $0 < t < 10$
6) Moving left: $\frac{11}{3} < t < 11$, Moving right: $0 \leq t < \frac{11}{3}, t > 11$
7) Moving left: $\frac{10}{3} < t < 12$, Moving right: $0 \leq t < \frac{10}{3}, t > 12$
8) Moving left: $0 < t < \frac{20}{3}$, Moving right: $t > \frac{20}{3}$ 9) $v(3) = 57, a(3) = 10$
10) $v(6) = 0, a(6) = -28$ 11) $v(4) = 16, a(4) = -22$ 12) $v(2) = -32, a(2) = -10$