

Rectilinear Motion Problems

- The position function of a particle moving on a coordinate line is given by $s(t) = t^3 - 9t^2 + 24t + 5$.
 - Write an expression for the velocity of the particle, $v(t)$.
 - Write an expression for the acceleration of the particle, $a(t)$.
 - When is the particle moving to the right? to the left?
 - Find the total distance traveled by the particle from $t = 0$ to $t = 4$.
- Let $s(t) = \frac{1}{3}t^3 + t^2 - 15t + 2$ describe the motion of a car for $t > 0$.
 - When is the car at rest?
 - When is the speed of the car constant?
 - When is the car speeding up? slowing down?
 - What is the total distance that the car travels from $t = 0$ to $t = 6$?
- If the position function of a particle is $x(t) = \frac{t}{t^2 + 9}$ for $t > 0$, find when the particle is changing direction.
- A particle moves along a coordinate line according to the function $s(t) = -t^3 + 4t^2 - 7$ over the interval $1 \leq t \leq 5$. What is the maximum speed of the particle?
- If the displacement from the origin of a particle moving along the x -axis is given by $s = 3 + (t - 2)^4$, then how many times does the particle reverse direction? What is the total distance that the particle travels from $t = 1$ to $t = 4$?
- If the position function of a particle is $x(t) = \sin\left(\frac{t}{2}\right)$ for $0 < t < 4\pi$, find when the particle is changing direction.
- If the position function of a particle is $x(t) = 2\sin^2 t + 2\cos^2 t$ for $t > 0$, find the velocity and acceleration of the particle.
- The velocity of a particle in motion along a line (for $t \geq 0$) is $v(t) = \ln(2 - t^2)$. Find the acceleration when the object is at rest.
- A particle moves along the x -axis so that at any time t its position is given by $x(t) = (t + 1)(t - 3)^3$. For what values of t is the velocity of the particle increasing?
 - $t > 3$ only
 - $0 < t < 3$ only
 - $1 < t < 3$ only
 - $t < 1$ or $t > 3$
 - $0 < t < 3$ or $t > 3$