

1. The velocity of a particle moving along the x-axis is given by $v(t) = 3t^2 - 3$ for $t \geq 0$.
 - a. If the particle is at $x = 16$ at $t = 3$, find the position at $t = 1$.
 - b. During what time periods is the particle moving to the left and to the right?
 - c. What is the acceleration of the particle at the first time the particle is at rest?
 - d. Is the particle ever at $x = 0$? If so, what is the velocity and acceleration at that time?
 - e. Is the particle's speed increasing or decreasing at $t = 2$? Why?
2. A particle moves along the x-axis for $0 \leq t \leq 6$ according to the acceleration equation $a(t) = \cos\left(\frac{\pi t}{2}\right)$.
 - a. What is the particle's velocity at $t = 3$ if $v = 1$ at $t = 2$?
 - b. What is the particle's position at $t = 5$ if it starts at the origin?
 - c. Another particle is moving along the y-axis according to the velocity equation $v(t) = 2t - 3$. During what time periods (if any) do the two particles' acceleration have the same sign?
 - d. During what time periods (if any) do the two particles' velocity have the same sign?
3. An object moves with velocity $v(t) = 9t^2 + 18t - 7$ for $t \geq 0$ from an initial position of $s(0) = 3$.
 - a. Write an equation for the position of the particle.
 - b. When is the particle changing direction?
 - c. What is the total distance the particle travels from $t = 2$ to $t = 5$?