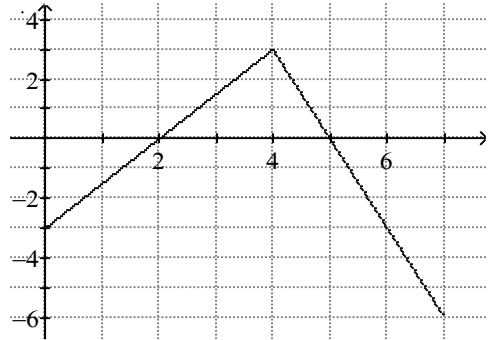


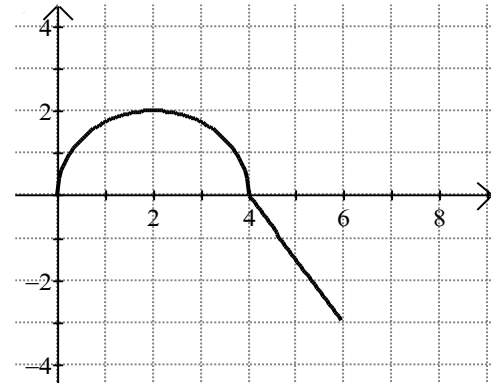
Particle Motion – Day 2

1. The graph of $v(t)$ of a particle measured in m/s for $t=0$ to $t=7$ is at the right. The position of the particle at $t=0$ is 7.



- When is the particle changing directions?
- What is the acceleration at $t = 2$?
- What is the maximum speed of the particle?
- Name the particles position at $t=4$ and $t=7$.
- When is the speed increasing?
- What is the average velocity of the particle over the 7 second interval?
- What is the average acceleration of the particle over the 7 second interval?

2. The graph of $a(t)$ of a particle measured in m/s for $t=0$ to $t=6$ is at the right. The velocity of the particle at $t=0$ is 2.



- Find the velocity at time $t=2$ and $t=6$.
 - What is the minimum velocity? When does it occur?
 - Is the particle speeding up or slowing down at $t=6$? Why?
3. $a(t) = 6t + 2$ and velocity is 2 and position is -2 at $t=0$.
- Find an expression for the velocity $v(t)$.
 - Find an expression for the position $x(t)$.

4. A particle moves along the x-axis so that its position is given by $x(t) = t^3 - 6t^2 + 9t + 6$.

- At what time is the particle at rest?
- During what interval is the particle moving right? JYA
- Find the position of the particle when the acceleration is 0.

5. A particle moves along the x-axis so that its position is given by $x(t) = t(t-1)^3$.

- At what time is the particle at rest?
- During what interval is the particle moving right? JYA
- Find the position of the particle when the acceleration is 0.

6. A particle moves along the x-axis so that its velocity at time t is given by $v(t) = -\cos(x^2)$ for $0 \leq x \leq 2$. At time $t = 0$, the particle is at position $x = 4$.
- Find the acceleration of the particle at time $t = 1$.
 - Find all points from $t = 0$ to $t = 2$ that the particle changes direction.
 - Find the total distance traveled by the particle from $t=0$ to $t=2$.
7. A particle moves along the x – axis in such a way that the acceleration at time t for $t > 0$ is given by $a(t) = 3t$. When $t = 1$, the position of the particle is 6 and the velocity is 2.
- Write an equation for the velocity, $v(t)$, of the particle for all $t > 0$.
 - Write an equation of the position, $x(t)$ of the particle for all $t > 0$.
 - Find the position of the particle when $t = 1$.
 - Find the average acceleration from $t = 0$ to $t = 3$.
 - Find the average velocity from $t = 0$ to $t = 3$.
8. A particle moves along the x-axis in such a way that its position at time t is given by $x(t) = (2t - 1)(t - 1)^2$.
- At what time(s) t is the particle at rest?
 - During what interval of time is the particle moving left? Justify your answer.
 - At what time during the interval found in (b) is the particle moving the fastest? (that is, the speed is the maximum)? Justify your answer.
9. A particle moves along the x – axis in such a way that the acceleration at time t for $t > 0$ is given by $a(t) = 2t - 1$. When $t = 1$, the position of the particle is 3 and the velocity is 1.
- Write an equation for the velocity, $v(t)$, of the particle for all $t > 0$.
 - Write an equation of the position, $x(t)$ of the particle for all $t > 0$.
 - Find the position of the particle when $t = 3$.

Answers

1. -
 - a. $t=2, 5$
 - b. $3/2$
 - c. 6
 - d. $t=4: 7$
 $t=7: 2.5$
 - e. $(2,4), (5,7)$
 - f. $-9/14$
 - g. $-3/7$
2. -
 - a. $t=2: 2+\pi$
 $t=6: 2\pi-1$
 - b. at $t = 0, v = 2.$
 - c. Slowing down; acc is neg, velocity is pos
3. -
 - a. $v(t) = 3t^2 + 2t + 2$
 - b. $x(t) = t^3 + t^2 + 2t - 2$
4. -
 - a. $t=1,3$
 - b. $(0,1)(3,\infty)$; v is pos!
 - c. $x(2) = 8$
5. -
 - a. $t=1, 1/4$
 - b. $\left(\frac{1}{4}, 1\right) (1, \infty)$
 - c. $x(1)=0, x(1/2) = -1/16$
6. -
 - a. $a(1) = 1.682$
 - b. $t = 1.253$
 - c. 1.493
7. -
 - a. $v(t) = \frac{3}{2}t^2 + \frac{1}{2}$
 - b. $x(t) = \frac{1}{2}t^3 + \frac{1}{2}t + 5$
 - c. 6
 - d. $9/2$
 - e. 5
8. -
 - a. $1, 2/3$
 - b. $(2/3, 1)$
 - c. Speed is a maximum at $5/6$
9. -
 - a. $v(t) = t^2 - t + 1$
 - b. $x(t) = \frac{1}{3}t^3 - \frac{1}{2}t^2 + t + \frac{13}{6}$
 - c. $29/3$