

Particle Motion HW Packet

Position Function and Domain worksheet

A particle moves according to a position function  $x(t) = 3t + 1$  where  $t$  is measured in seconds

1. Where is the particle at  $t = 0$ ?
2. Where is the particle at  $t = 5$ ?
3. How far did it travel from  $t = 0$  to  $t = 5$ ?

A particle moves according to a position function  $x(t) = t^2 - 4t + 3$  where  $t$  is measured in seconds .

4. Where is the particle at  $t = 0$ ?
5. Where is the particle at  $t = 2$ ?
6. How far did it travel from  $t = 0$  to  $t = 2$  (find Displacement and Total Distance)?
7. Where is the particle at  $t = 3$ ? What happened?
8. How far did it travel from  $t = 2$  to  $t = 3$  (find Displacement and Total Distance)?
9. How far did it travel from  $t = 0$  to  $t = 3$  (find Displacement and Total Distance)?
10. How far did it travel from  $t = 0$  to  $t = 5$  (find Displacement and Total Distance)?

Find the domain and range for the following functions

11.  $y = 3x + 2$

12.  $y = x^2 - 1$

13.  $y = \sqrt{x-1}$

14.  $y = \sqrt{x^2 - 9}$

15.  $y = \frac{1}{x}$

16.  $y = \frac{3}{x-2}$

17.  $y = \frac{x-1}{x-4}$

18.  $y = \frac{x^2 - x - 2}{x-2}$

19.  $y = \sin x$

20.  $y = \tan x \quad 0 \leq x \leq \pi$

21.  $y = \tan x$

Answer Key

1) 1

2) 16

3) 15 units

4) 3

5) -1

6) Displacement = -4, Distance Traveled = 4 (went 4 to the left)

7) It's at 0. Means particle moved 1 to the right (since it was at -1 when t=2)

8) 1 unit to the right

9) -3 (displacement); 5 (total distance)

10) 5 (displacement); 13 (total distance)

11)  $D = \mathbf{R}$ ;  $R = \mathbf{R}$

12)  $D = \mathbf{R}$ ;  $R = [-1, \infty)$

13)  $D = [1, \infty)$ ;  $R = [0, \infty)$

14)  $D = (-\infty, -3] \cup [3, \infty)$ ;  $R = [0, \infty)$

15)  $D = \{x \text{ such that } x \neq 0\}$ ;  $R = (-\infty, 0) \cup (0, \infty)$

16)  $D = \{x \text{ such that } x \neq 2\}$ ;  $R = (-\infty, 0) \cup (0, \infty)$

17)  $D = \{x \text{ such that } x \neq 4\}$ ;  $R = (-\infty, 1) \cup (1, \infty)$

18)  $D = \{x \text{ such that } x \neq 2\}$ ;  $R = (-\infty, 3) \cup (3, \infty)$

19)  $D = \mathbf{R}$ ;  $R = [-1, 1]$

20)  $D = [0, \pi/2) \cup (\pi/2, \pi]$ ;  $R = \mathbf{R}$

21)  $D = \{x \text{ such that } x \neq n\pi + \pi/2\}$ ;  $R = \mathbf{R}$

## Position Velocity Acceleration

Find the position, velocity, acceleration at the given times for the given position functions. Find when the particle is stopped. Find the distance traveled and displacement between each time,

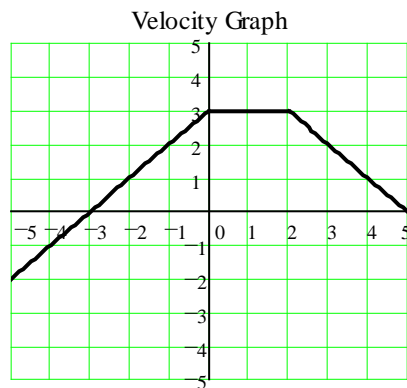
1.  $x(t) = t^3 - 3t^2 - 24t + 10$ ,  $t = 0, 5$

2.  $x(t) = 6t + 3\cos(t) + 5$ ,  $t = 0, \pi$

3.  $x(t) = -2t^3 - 3t^2 + 36t + 10$ ,  $t = 0, 2$

4.  $v(t) = 3t^2 - 12t - 15$ . When is the particle at rest? What is the velocity when the acceleration is zero? What is the position when the particle is at rest if  $x(0) = 12$ ?

5.  $v(t)$  is shown by the graph. Find the acceleration and the velocity at  $t = 3$ . What the total distance traveled from  $t = -5$  to  $t = 5$ ?



Answer Key:

- 1)  $x(0) = 10$ ;  $x(5) = -60$   
 $v(0) = -24$ ;  $v(5) = 21$   
 $a(0) = -6$ ;  $a(5) = 24$   
 Stopped @  $t = 4$   
 Displacement =  $-70$ ; Total Distance Traveled =  $90$
- 2)  $x(0) = 8$ ;  $x(\pi) = 6\pi + 2$   
 $v(0) = 6$ ;  $v(\pi) = 6$   
 $a(0) = -3$ ;  $a(\pi) = 3$   
 Stopped: never  
 Displacement =  $12.849$ ; Total Distance Traveled =  $12.849$
- 3)  $x(0) = 10$ ;  $x(2) = 54$   
 $v(0) = 36$ ;  $v(2) = 0$   
 $a(0) = -6$ ;  $a(2) = -30$   
 Stopped:  $t = 2$   
 Displacement =  $44$ ; Total Distance Traveled =  $44$
- 4) At rest:  $t = 5$   
 Velocity when  $a = 0$ :  $v = -27$   
 Position when at rest:  $x(5) = -88$
- 5)  $V(3) = 2$ ;  $a(3) = -1$   
 Total Distance Traveled =  $17$