

# Particle Motion HW Key:

①  $s(t) = t^3 - 12t^2 + 36t, t \geq 0$

a)  $v(t) = 3t^2 - 24t + 36$

b)  $v(3) = -9 \text{ m/sec}$

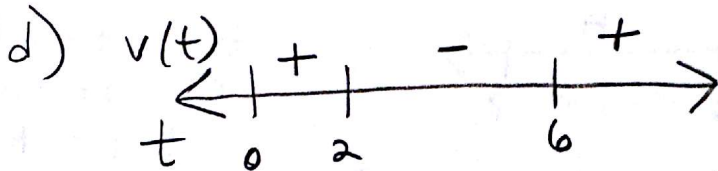
c)  $v(t) = 0 = 3t^2 - 24t + 36$

$$0 = 3(t^2 - 8t + 12)$$

$$0 = 3(t-6)(t-2)$$

$$t = 6 \text{ sec}$$

$$t = 2 \text{ sec}$$



forward when  $v(t)$  is pos  
 $(0, 2) \cup (6, \infty)$

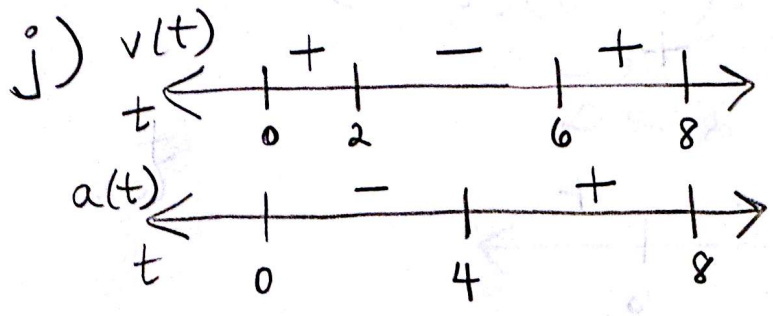
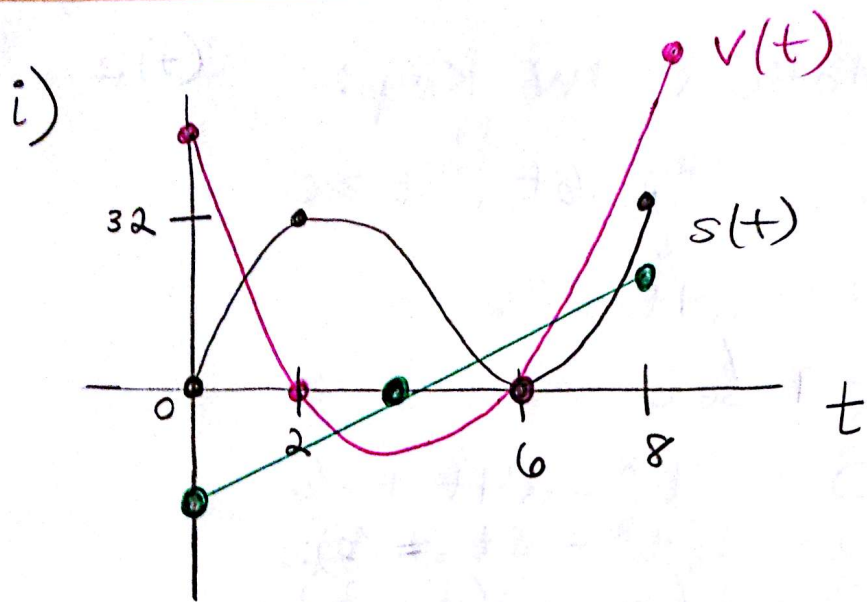
e)

$t$	$s(t)$
0	0
2	32
6	0
8	32

displacement:  $32 - 0 = 32 \text{ m}$

f)  $32 + 32 + 32 = 96 \text{ m} = \text{total distance}$

h)  $a(t) = 6t - 24$



$$a(t) = 6t - 24$$

$$0 = 6t - 24$$

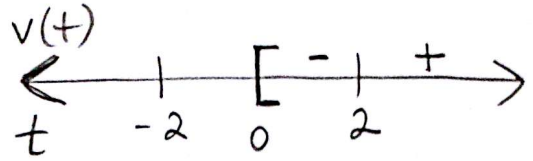
$$t = 4$$

speeding up:  $(2, 4) \cup (6, 8)$   
 slowing down:  $(0, 2) \cup (4, 6)$

$$y(t) = t^3 - 12t + 3, \quad t \geq 0$$

a)  $v(t) = 3t^2 - 12$   
 $a(t) = 6t$

b)  $v(t) = 0 = 3t^2 - 12$   
 $0 = 3(t^2 - 4)$   
 $t = 2, -2$



up: when  $v(t)$  is pos  $(2, \infty)$   
 down: when  $v(t)$  is neg  $(0, 2)$

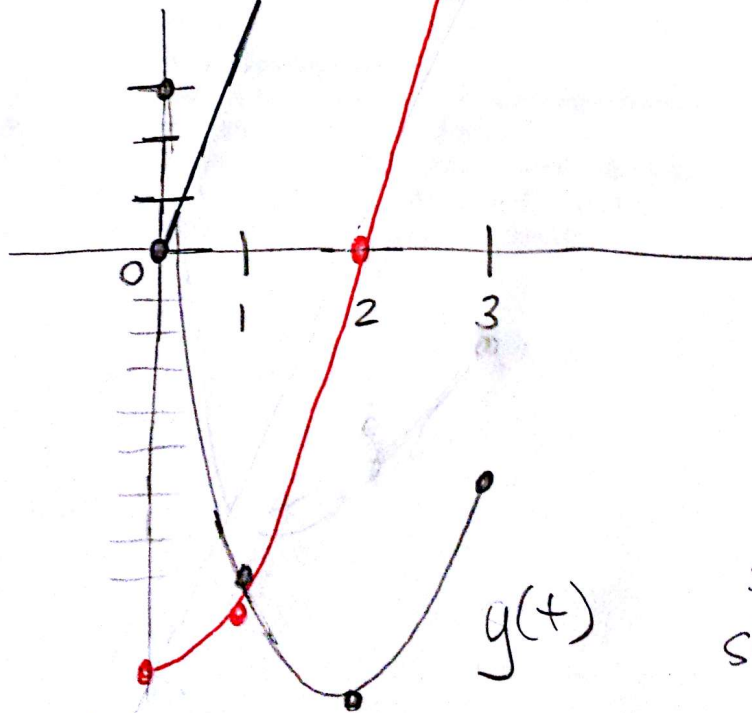
c)

t	y(t)
0	3
2	-13
3	-6

displacement =  $-6 - 3 = -9$

d) distance = 23

e)



$y(0) = 3$   
 $y(1) = -8$   
 $y(2) = -13$   
 $y(3) = -6$

speed up:  $(2, \infty)$   
 slow down:  $(0, 2)$

$a(t) = 0 = 6t$   
 $t = 0$

