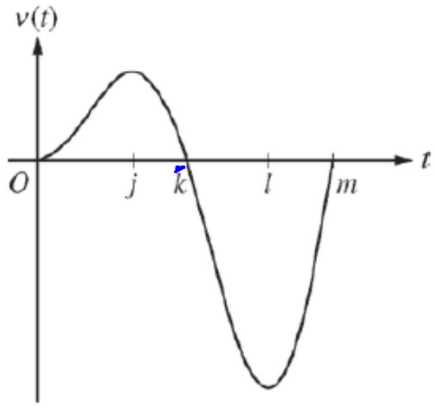
Motion on a line (Interpreting f'(velocity) graphs)

I. Review: Motion Along A Line

If $x(t)$ represents the position of a particle along the x-axis at any time t, then the following statements are true.

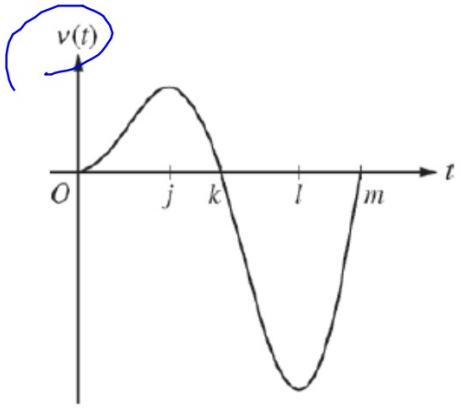
1. "Initially" means_____=0.
2. "At rest" means_____=0.
3. If the velocity of the particle is positive, then the particle is moving to the _____.
4. If the velocity of the particle is _____, then the particle is moving to the left.
5. To find average velocity over a time interval, divide the change in _____ by the change in time.
6. Instantaneous velocity is the velocity at a single moment or _____in time.
7. If the acceleration of the particle is positive, then _____is increasing.
8. If the acceleration of the particle is _____, then the velocity is decreasing.
9. In order for a particle to change direction, the _____must change signs.
10. Speed is the _____of velocity.



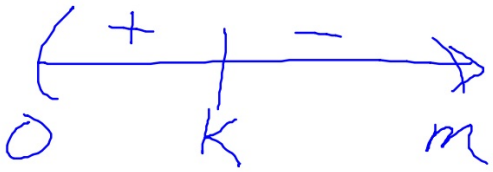
(0, m)

1) State the value(s) of t where the particle is at rest.

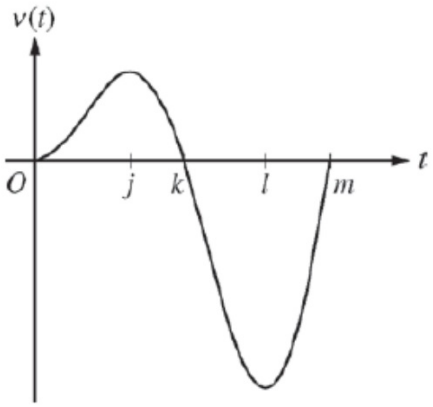
$t = k$



2) State the value(s) of t where the particle is changing direction.

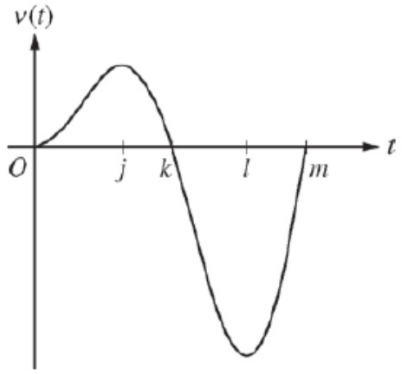


$t = k$



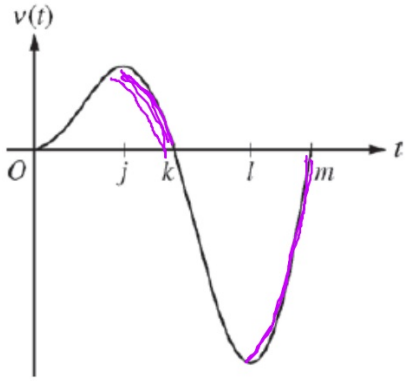
3) State the interval(s) where the particle is moving to the right.

$(0, k)$



4) State the interval(s) where the particle is moving to the left.

opposite signs of $v(t), a(t)$



(j, k)

$v(t) > 0$

$a(t) < 0$

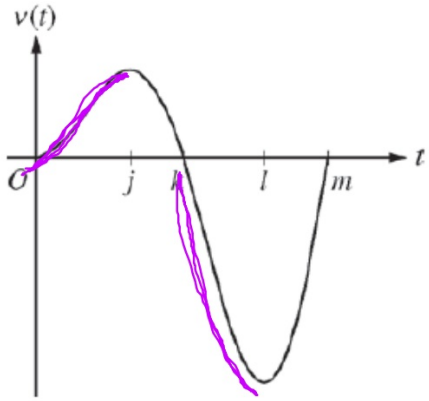
5) State the interval(s) where the particle is slowing down.

(l, m)

$v(t) < 0$

$a(t) > 0$

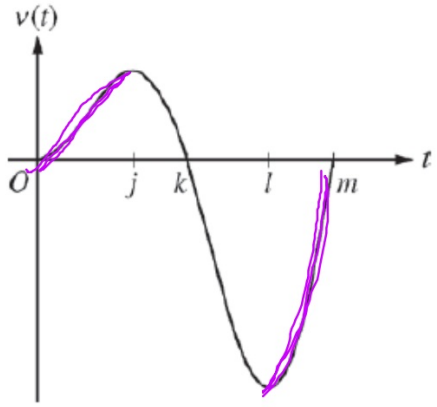
$(j, k) \cup (l, m)$



6) State the interval(s) where the particle is speeding up.

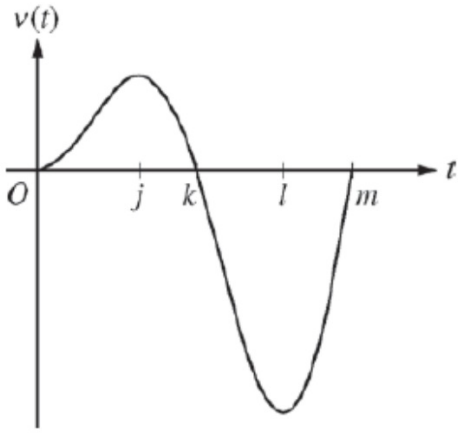
(0, j); v(t) and a(t) have same sign.

(k, ℓ); v(t) and a(t) have same sign



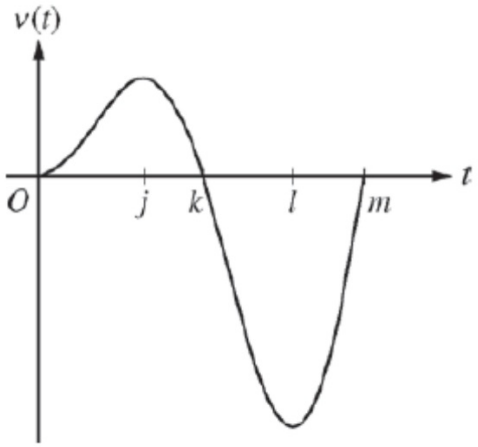
7) State the interval(s) where the velocity is increasing.

$(0, j) \cup (l, m)$ $\quad v'(t) > 0$



8) State the interval(s) where the velocity is decreasing.

(j, l) $v'(t) < 0$



9) At what time(s) is the acceleration zero?

$t = j, l$

$a(t) = 0$

2. Analytical (NO CALCULATOR)
A particle moves along the x-axis so that at any time t its position is given by:

$$x(t) = t^3 - 6t^2 + 9t + 11$$

b) At t=1, is the velocity of the particle increasing or decreasing? JYA.

$x'(t) = 3t^2 - 12t + 9$

$x''(t) = 6t - 12$

$x''(1) < 0$

2. Analytical (NO CALCULATOR)

A particle moves along the x-axis so that at any time t its position is given by:

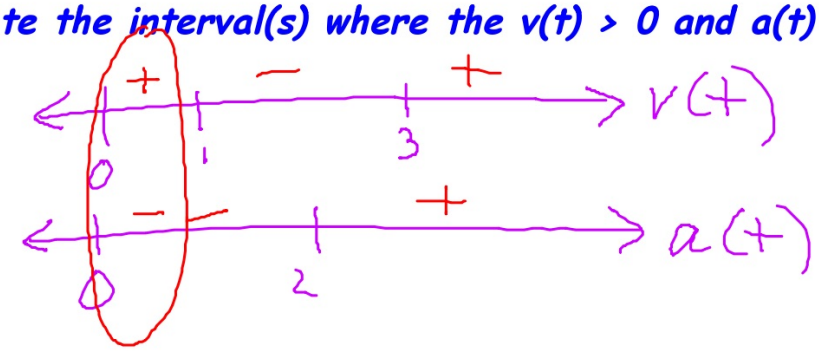
$[0,\infty)$

$$x(t) = t^3 - 6t^2 + 9t + 11$$

$x'(t) = 3t^2 - 12t + 9$

$3(t-1)(t-3)$

d) ***State the interval(s) where the v(t) > 0 and a(t) < 0.*** $(0,1)$

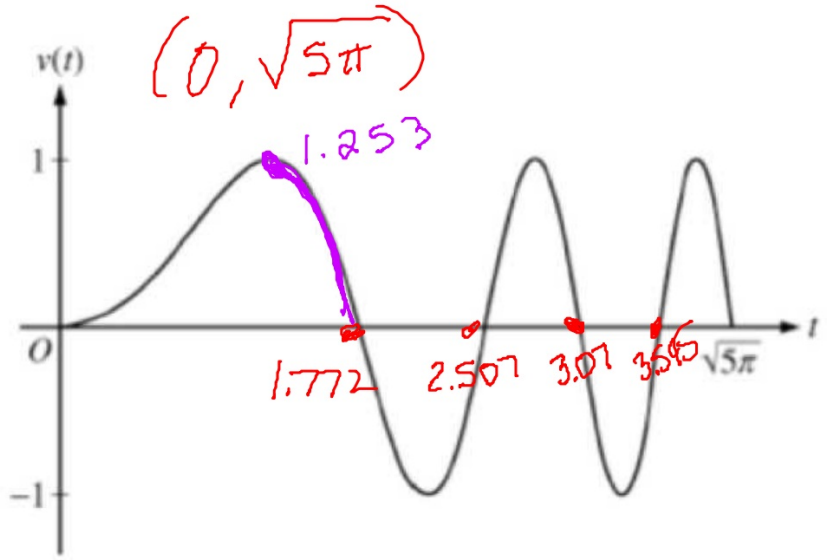


2. Analytical (NO CALCULATOR)
A particle moves along the x-axis so that at any time t its position is given by:

$$x(t) = t^3 - 6t^2 + 9t + 11$$

e) At t=5, is the speed of the particle increasing or decreasing? JYA.

HW: 6 (CALCUALTOR)

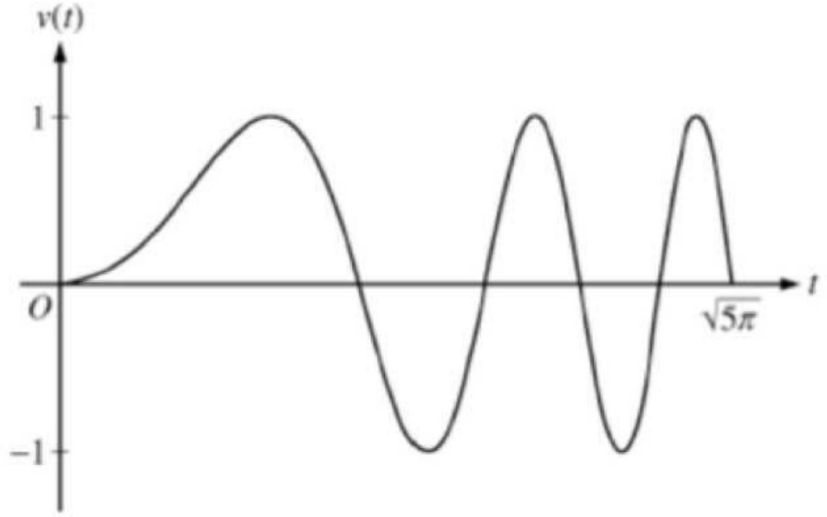


$$v(t) = \sin(t^2)$$

a) When is the particle moving to the left? JYA.

$(1.772, 2.507) \cup (3.07, 3.545)$ $v(t) < 0$

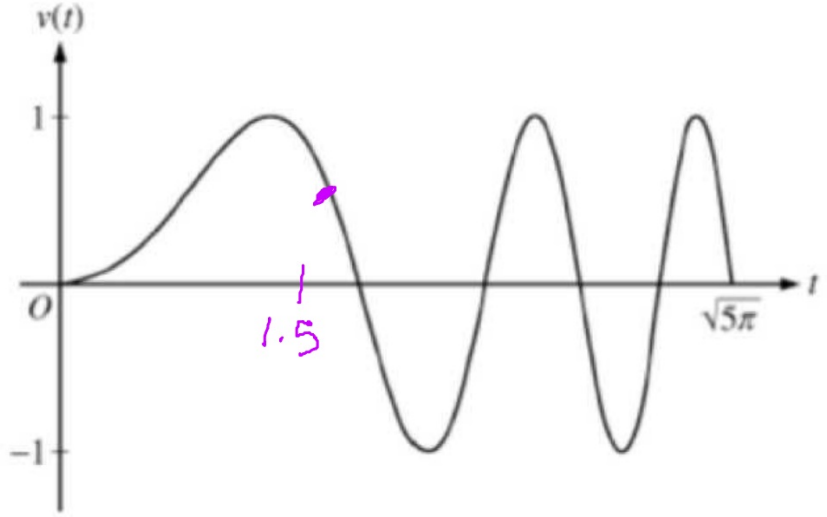
HW: 6 (CALCUALTOR)



$$v(t) = \sin(t^2)$$

e) When does the particle change direction? JYA.

HW: 6 (CALCUALTOR)



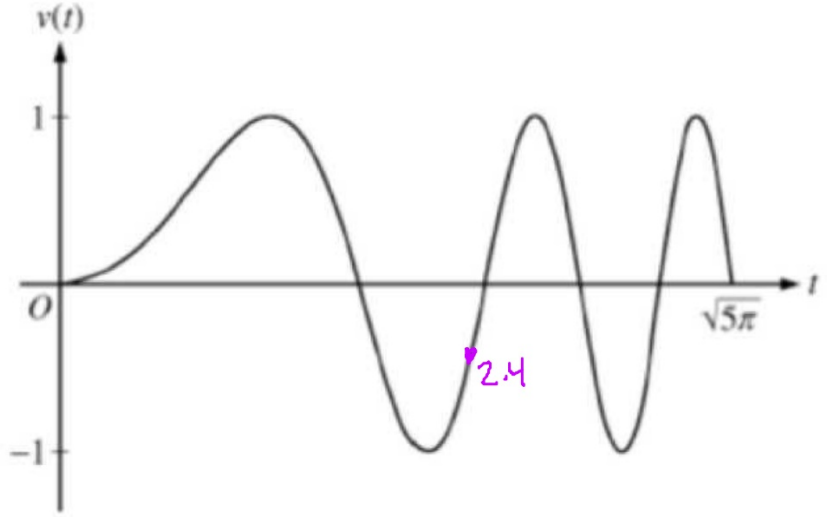
$$v(t) = \sin(t^2)$$

c) Is the particle slowing down at t =1.5? Explain.

$V(1.5) > 0$

$V'(1.5) < 0$

HW: 6 (CALCUALTOR)



$$v(t) = \sin(t^2)$$

d) Is the particle speeding up at t = 2.4? Explain.

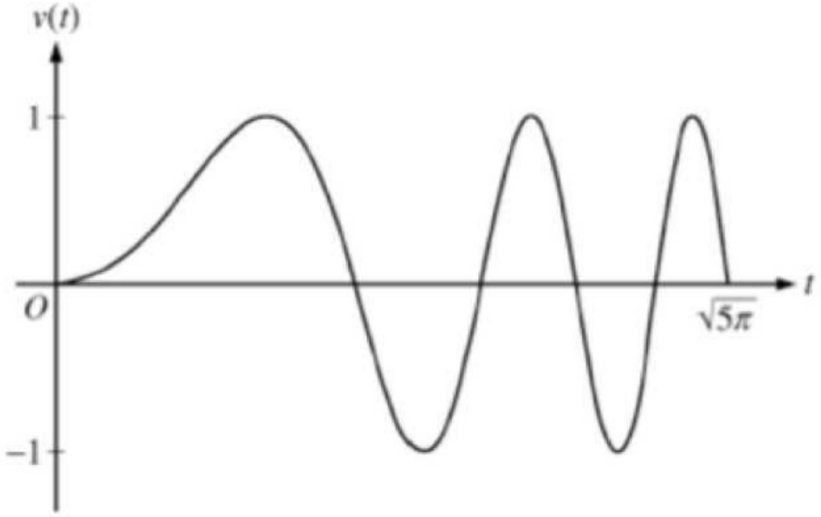
No $v(2.4) < 0$

$v'(2.4) > 0$

HW: 6 (CALCUALTOR)

Avge velocity
$[a,b]$

$$\frac{x(b)-x(a)}{b-a}$$



$$v(t) = \sin(t^2)$$

f) What is the average acceleration on the interval [1, 4]?

$$\frac{v(4)-v(1)}{4-1}$$