YAKEEN NEET 2.0

2026

Motion in a Straight Line

Physics | Lecture - 6

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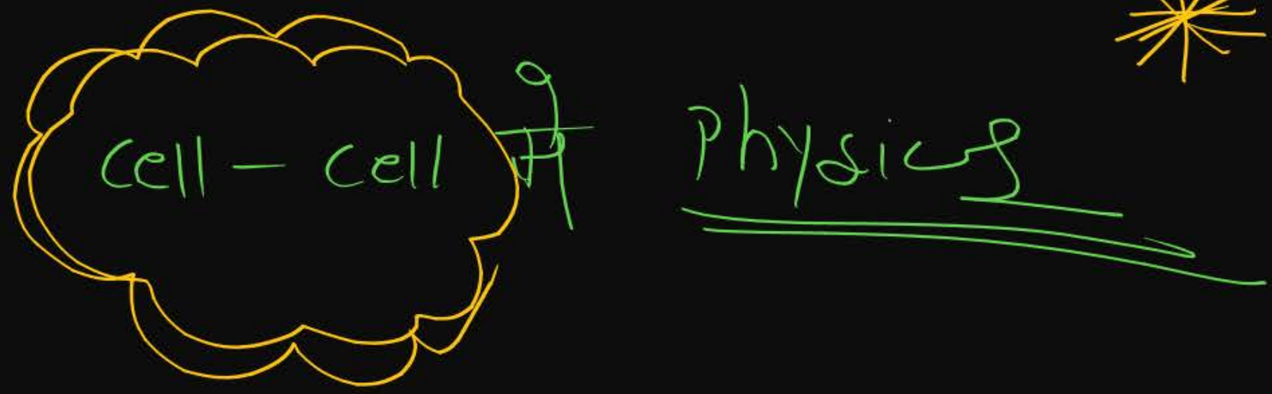
Topics to be covered

1. # Acc^{n} & Question solving approach.....
2.
3.
4.



(1) To change in direction of motion object must comes to at rest.

Ex- circular motion

(a) True (69%)

(b) false 31%

#MR Scam hai

MR* Box-

1-D me dir^n change (U-turn) karne ke liye rukna (rest) hona must hai.

@MRPHYSICSS

Sangtosh assignment 2

Acceleration → ye Motion (Slow/fast) ka feel nahi hai

- change in velocity per sec ka feel hai.
- vector
- direction of accn along change in velocity.
- $\vec{F} = m\vec{a}$ (m → scalar)
- unit m/s^2

accn along force ($m = const$)

Acceleration

- gn time (Δt)
- at time 't'

$$\langle \vec{a}_{Avg} \rangle = \frac{\vec{V}_f - \vec{V}_i}{\Delta t}$$

$$\langle a \rangle_{Avg} = \frac{\int a\,dt}{\int dt}$$

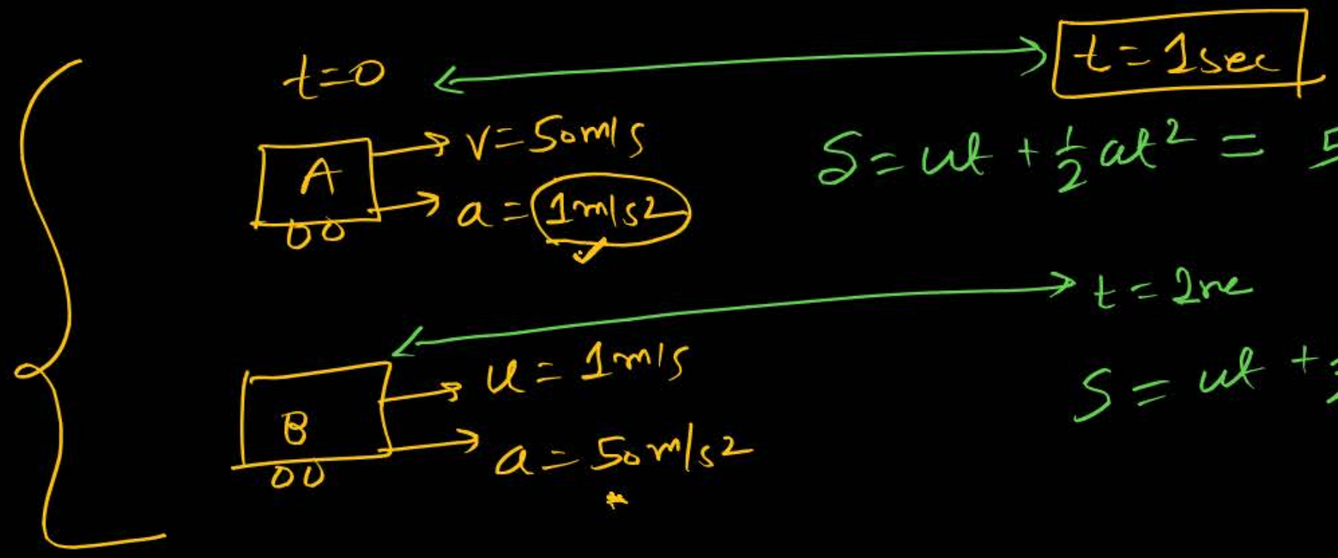
slope of V/t graph is instantaneous accn *

$$\vec{a}_{inst} = \frac{d\vec{V}}{dt} = \frac{d}{dt}\left(\frac{dx}{dt}\right) = \frac{d^2x}{dt^2}$$

$$\vec{a}_{inst} = \frac{d\vec{V}}{dt} \times \frac{dx}{dx} = V_x \frac{dV}{dx}$$

use when V is function of x

Ex $V = 2x + 4$



$S = ut + \frac{1}{2}at^2 = 50 \times 1 + \frac{1}{2} \times 1 \times (1)^2 = 50 + \frac{1}{2} = 50.5m.$

$S = ut + \frac{1}{2}at^2 = 1 \times 1 + \frac{1}{2} \times 50 \times (1)^2 = 1 + 25$

$= 26m.$

Likh.la abhi A fast moving hai But Kuch time Bad B fast moving ho jayga

time = 0 sec	t = 1 sec	t = 2 sec	Nature of motn.
O → V = 10 m/s	O → V = 10 m/s, acc^n = $\frac{10-10}{1}$ = 0	O → V = 10 m/s	uniform motn, velocity = const^n, acc^n = 0
O → V = 10 m/s	O → V = 20 m/s, $a_{Avg} = \frac{20-10}{1-0} = 10\ m/s^2$	O → V = 28 m/s, $a = \frac{28-20}{2-1} = 8\ m/s^2$	velocity ↑, acc^n ↓, Non uniform motn.
O → V = 10 m/s	O → V = 20 m/s, $a = \frac{20-10}{1-0} = 10\ m/s^2$	O → V = 35 m/s, $a = \frac{35-20}{2-1} = 15\ m/s^2$	Velocity ↑, acc^n ↑, Non-uniform
O → u = 10 m/s	O → 6 m/s, $a = \frac{6-10}{1-0} = -4\ m/s^2$	O → 4 m/s, $a = \frac{4-6}{2-1} = -2\ m/s^2$	u ↓, a ↓ (value of acc^n) → Non uniform
O → V = 10 m/s	O → 8 m/s, $a = -2\ m/s^2$	O → 2 m/s, $a = \frac{2-8}{2-1} = -6\ m/s^2$	u ↓, |acc^n| ↑ → Non-Uniform

Bad में जमीन लेना

Retarded

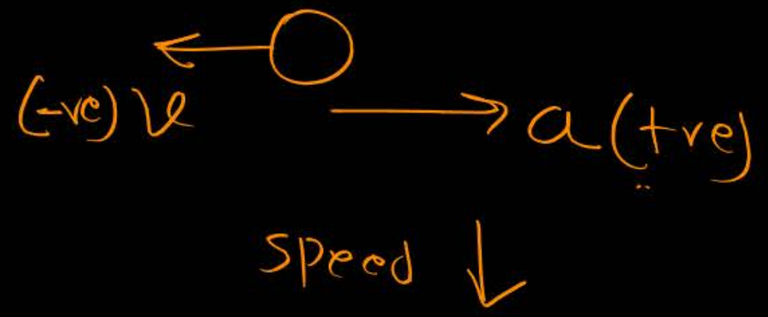
acc^n

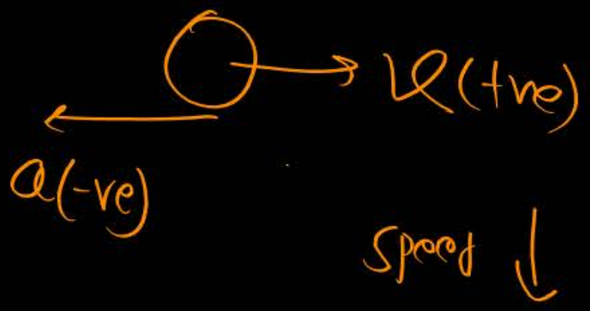
acc^n

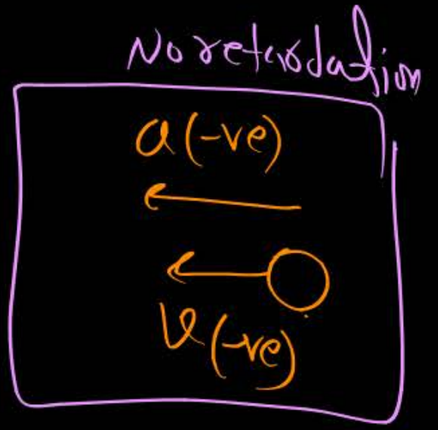
Retardation → acc^n which is opposite to the velocity.

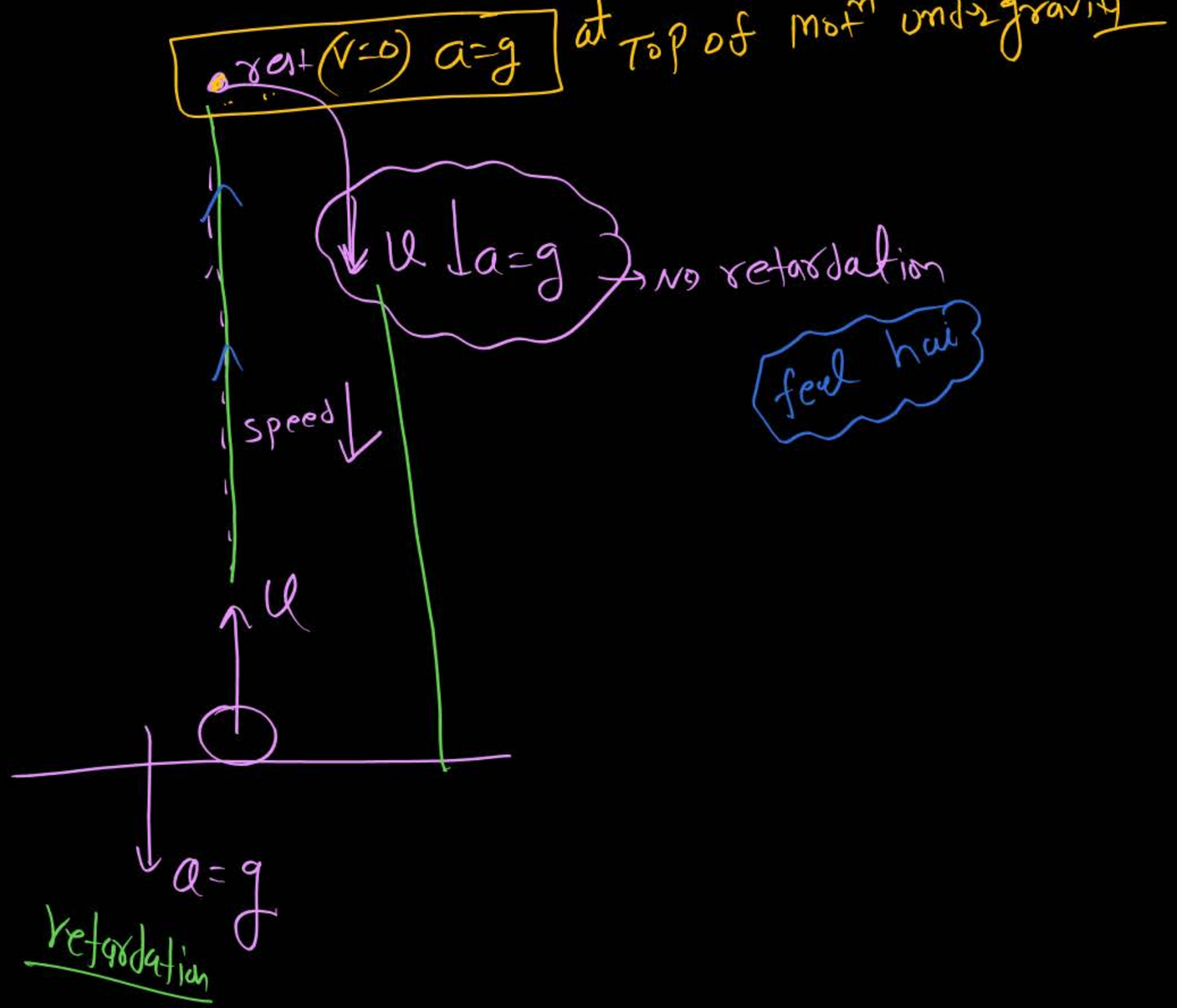
→ Retardation can be +ve or −ve ✓

→ मंदन (To slow down)
Speed ↓

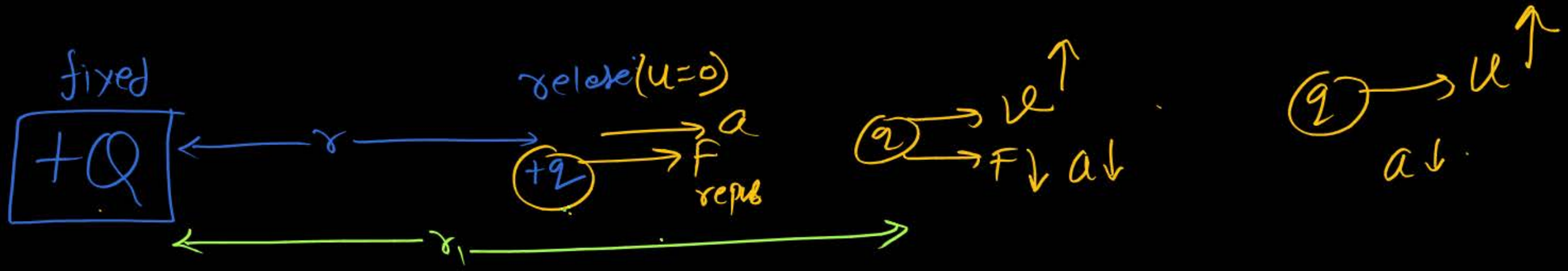







rest (v=0) a=g
at Top of motn under gravity
u la=g
No retardation
feel hai
speed
u
a=g
Retardation

Case-1

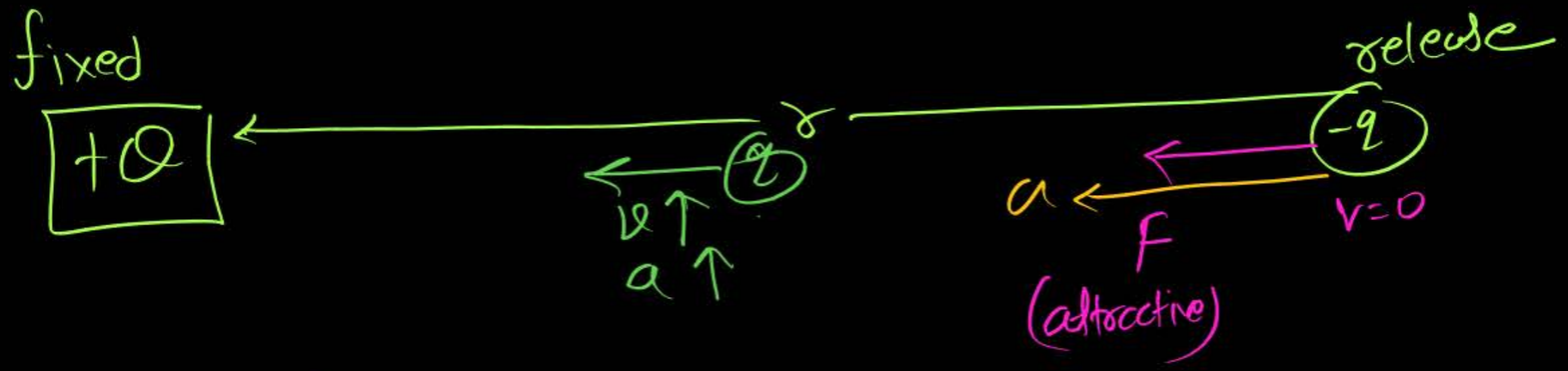


(long range) $\downarrow F = \frac{KQq}{r^2 \uparrow}$ (distan)

force ↓ → accⁿ ↓ → velocity ↑

→ velocity slowly change. horaha.

Case-2



$$\uparrow F = \frac{kQq}{r^2 \downarrow}$$

→ acc^n ↑

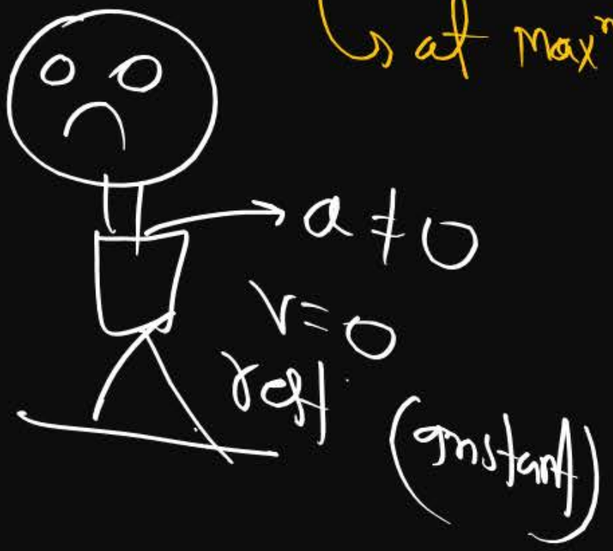
Velocity ↑

Question

Which of the following option is correct:

1. Velocity of object increasing and acceleration may decreasing.
2. Velocity of object decreasing and acceleration may increasing.
3. Acceleration may be non-zero when velocity of object is zero.
4. All of these.

→ at max^m height of moth under gravity,



Question

Object is moving such that its velocity and acceleration is in opposite direction then

1. Speed may constant.
2. Speed may increasing.
3. Speed must be decreasing.
4. Speed may be increasing or decreasing.

Question

An object is moving with constant velocity then which of the following option is correct

a = 0

1. Acceleration may be increasing.
2. Acceleration is zero.
3. Acceleration is decreasing.
4. Acceleration is non-zero.

Question

Which of the following is wrong

1. Velocity increasing and acceleration decreasing.
2. $\vec{V} \downarrow$ and $\vec{a} \uparrow$
3. $\vec{V} \uparrow$ and $\vec{a} \downarrow$
4. None of these.

Likna hai

Some Wrong example

(a) v is increasing ; $acc = 0$

(b) $v = \text{Cost}^n$ but a increasing.

(c) $v = \text{Cost}^n$ & $\vec{a} =$ Non zero Cost^n

speed ↑

1-D motⁿ without change in dirⁿ.

(straigh line Path)

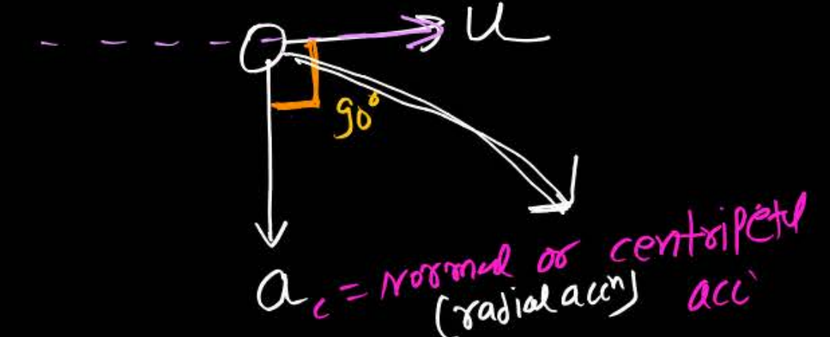
Angle b/w $\vec{u}$ & $\vec{a}$ is 0°

speed ↓ and

(1-D) object will take u-turn after some time.

(Straigh line with u-turn)

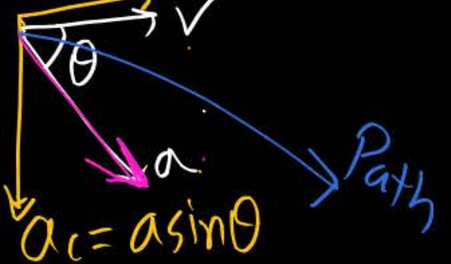
Angle b/w $\vec{u}$ & $\vec{a}$ 180°



at this instⁿ a will Chage velocity in y (2-D) Path

Next chapter *

$a_T = a\cos\theta$ (Tangential)



object ka future Path velocity and acc^n ka Angle decide Karega

Wali Concept

$dx = v\,dt$

$\int dx = \int v\,dt$

$\text{disp}^m = \int v\,dt$ = Area of v/t graph

$dv = a\,dt$

$\int dv = \int_{t_1}^{t_2} a\,dt$

change in velocity $= \int a\,dt$ = Area of a/t graph

$\int x\,dt$ = Area of x/t graph

नाली

x (Position)

v (Velocity)

a (acc^n)

$\frac{da}{dt}$ = Jerk

नाली

$V = \frac{dx}{dt}$ = slope of x/t graph is velocity

$a = \frac{dv}{dt} = \frac{d^2x}{dt^2}$

$a = v\frac{dv}{dx}$

slope of v/t is acc^n

slope of a/t graph = नाली

MR* BOX

→ (1) Pahle dekho quetion me **give kya hai**

→ (2) find kya karna hai

→ (3) given & find kare wale P.Q me

kya relation hai

mpk pdx

Kinematics ka GOD accn hai
↳ yahi decide karta question ka approach kya hoga.

→ question dekhte hi boley hey Bhaiya accn Darshan dijiye

Ex of variable accn
$a = 2t$
$a = \sin(t)$
$a = e^t$
$a = 2x^2$

# $acc^n = 0$	$a =$ Const^n accn.	(Variable acc^n)
$\vec{u} =$ Const^n Uniform motn $S = u \times t$ ↳ disp^m $v_{inst} = v_{Avg}$ (1-D motion)	Ex $a = 5 m/s^2$ $a = 2 m/s^2$ ↳ we will use equation of motion. $\vec{v} = \vec{u} + \vec{a}t$ $\vec{s} = \vec{u}t + \frac{1}{2}at^2$ $v^2 - u^2 = 2as$	↳ use Vali Concept integration & Differentiation

Question

Object is moving with acceleration $2\ m/s^2$ its velocity at $t = 0$ is $10\ m/s$ then find its velocity at $t = 4$ sec.

change in velocity per sec

Soln $a = 2 m/s^2$ (fixed)

$V = u + at$

$V = 10 + 2 \times 4$

$V = 10 + 8$

$V = 18 m/s$

Question

Velocity at $t = 0$ sec is 10 m/s its velocity becomes 40 m/s after 6 sec then find acceleration.

$$a_{Av} = \frac{v_f - v_i}{\Delta t}$$

$$= \frac{40 - 10}{6 - 0}$$

$$= \frac{30}{6} = 5 \text{ m/s}^2$$

Question

Velocity at $t = 2$ sec is 20 m/s its $t = 5$ sec it becomes 32 m/s then velocity at 7 sec will be:

H/W

Question

Ramlal is moving with velocity $3\hat{\imath} + 4\hat{\jmath}$ at t = 0 after 5 sec its velocity becomes $4\hat{\imath} + 3\hat{\jmath}$ then find average acceleration.

HID

Question

Kallu is moving with speed 40 m/s in north after 10 sec he is moving with 40 m/s in east then find

(i) Magnitude of rate of change in velocity.

(ii) Rate of change in magnitude of velocity.

Question

Find acceleration in each term:

$x = 4t^2 + 6$

$v = \frac{dx}{dt} = 4(2t) + 0$

$= 8t \text{ m/s}$

$a = \frac{dv}{dt} = 8\frac{dt}{dt}$

$a = 8 \text{ m/s}^2$

$x = 3t^2 + 4t + 6$

$v = \frac{dx}{dt} = 3(2t) + 4\frac{dt}{dt} + 0$

$v = 6t + 4$

$a = \frac{dv}{dt} = 6$

$x = 2t^3 + 5t$

$v = \frac{dx}{dt} = 2(3t^2) + 5$

$v = 6t^2 + 5$

$a = \frac{dv}{dt} = 6(2t)$

$= 12t$

$x = t^4 + 4t$

$v = \frac{dx}{dt} = 4t^3 + 4$

$a = 4(3t^2) + 0$

$a = 12t^2$

$v = 3t^2 + 4$

$a = \frac{dv}{dt} = 3(2t)$

$a = 6t$

$v = 3t^3 + 4$

$a = \frac{dv}{dt} = 3(3t^2) + 0$

$a = 9t^2$

$v = t^4 + 4$

$a = \frac{dv}{dt} = 4t^{4-1} + 0$

$a = 4t^3$

$v = 2x + 4 \longrightarrow a = \frac{dv}{dt}$

$\frac{dv}{dx} = \frac{d(2x+4)}{dx} = 2 \times 1 + 0$

$\frac{dv}{dx} = 2$

$a = v\frac{dv}{dx} = (2x+4) \times 2$

$= 4x + 8$

$x \propto t^2$

$v \propto t$

↳ only then acc^n is non-zero

Const^n

$V = 6t + 4$

$a = \frac{dv}{dt} = \frac{d(6t+4)}{dt} = 6 \times 1 = 6 m/s^2$

#

$x = \frac{1}{t^2}$

$x = \sqrt{t}$

$x = \frac{1}{t}$

$x = \frac{1}{t^3}$

→ acc^n Varible

#

$x = \sin t$

$x = e^t$

$x = \frac{1}{2+t^2}$

→ acc^n varibe in all

#

$v = \frac{1}{t}$

$v \propto t^2$

$v = \sin(t)$

$v = e^t$

→ acc^n variable

likho

If $V = 2x^2$ then find acc^n ??

$a = \frac{dv}{dt}$ ✗

$a = v\frac{dv}{dx}$ ✓

Soln

$$\frac{dv}{dx} = 2\frac{dx^2}{dx}$$

$$= 2(2x)$$

$$\boxed{\frac{dv}{dx} = 4x}$$

$$a = v\frac{dv}{dx}$$

$$= 2x^2 [4x]$$

$$\boxed{a = 8x^3}$$ → variable acc^n

MR^x BOX

If v is function of (x), then find dv/dx then Put $\boxed{a = v\,dv/dx}$

If $v = 2\sqrt{x}$ then find acc^n ⟶ (likho)

Soln $\frac{dv}{dx} = \frac{d\,2\sqrt{x}}{dx} = 2\,\frac{1}{2}\,x^{\frac{1}{2}-1}$

$= x^{-\frac{1}{2}}$

$= \frac{1}{\sqrt{x}}$

(i) $x \propto t^2$

(ii) $v \propto t$

(iii) $v \propto \sqrt{x}$ ⟶ acc^n is non-zero Cost^n

$a = v\frac{dv}{dx}$

$= 2\sqrt{x} \times \frac{1}{\sqrt{x}}$

$a = 2\ m/s^2$

non-zero cst^n acc^n

Question

In which case acceleration is non-zero cᵒˢⁿ

1. $x = \sqrt{t} + 4$
2. $\sqrt{x} = t - 3$ → $x = (t-3)^2$
3. $x = t^{-2} + 4$ → $x = \frac{1}{t^2} + 4$
4. $x = \frac{4}{t}$
5. $x = t^3 + 4$
6. $x = \frac{3}{t^2}$
7. $x = 4t^2 + 6$
8. $v = 3t^2 + 4$ → $a = \frac{dv}{dt} = 3(2t)$
9. $v = 6t - 4$
10. $v = \sqrt{x}$
11. $v = x^2 + 4$
12. $v = 2x + 3$ (a = variable) $a = v\frac{dv}{dx}$
13. $a = 2t$
14. $a = 3x$

Ans 2, 7, 9, 10

हर पर लिखवा दे।

Question

If velocity $V = k\sqrt{x}$ then which of the following option is correct for position. [IIT-2006]

(a) $x \propto \sqrt{t}$

(b) $x \propto t^3$

(c) $x \propto t^{-2}$

(d) $x \propto t^2$

MR^*

$V \propto \sqrt{x}$

$x \propto t^2$

acc^n = (d)th

आगे से करेंगे ||

$V = k\sqrt{x}$

$\frac{dx}{dt} = k\sqrt{x}$

$\int \frac{dx}{\sqrt{x}} = \int k\,dt$

$\int x^{-\frac{1}{2}}\,dx = k\int dt$

$\frac{x^{-\frac{1}{2}+1}}{-\frac{1}{2}+1} = kt$

$\frac{\sqrt{x}}{1/2} = kt$

$\sqrt{x} \propto t$

$x \propto t^2$

Question

If the displacement of a particle varies with time as $\sqrt{x} = t + 7$, *then*

NEET

1. Velocity of the particle is inversely proportional t ✗
2. Velocity of the particle is proportional to t^2 ✗
3. Velocity of the particle is proportional to $\sqrt{t}$ ✗
4. ✓ The particle moves with constant acceleration

$\sqrt{x} = t + 7$

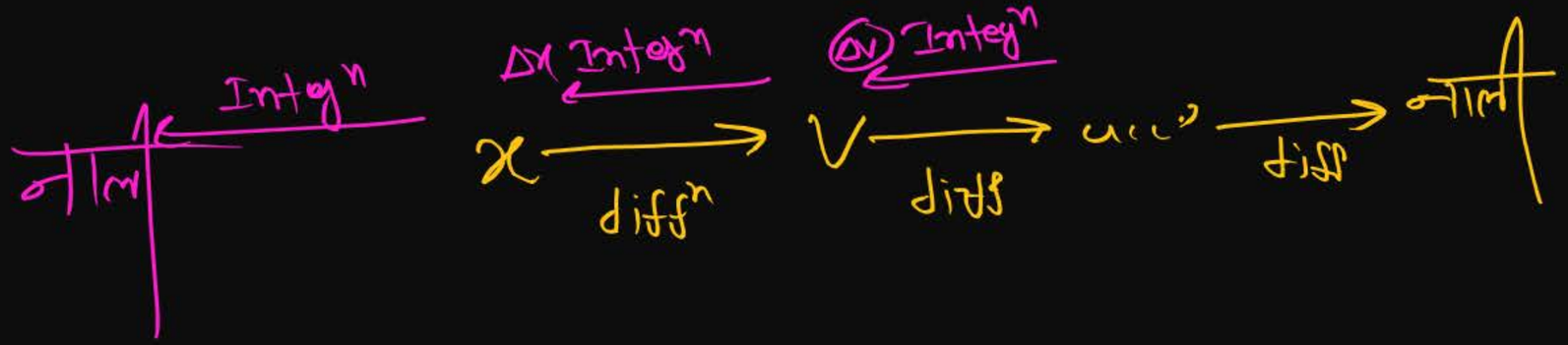
$x = (t+7)^2$

$x = t^2 + 49 + 14t$

$V = 2t + 14$

Question

Object is moving such that its position given as a function of time $x = \alpha t^2 + \beta t + \gamma$ then find initial velocity, initial acceleration and initial position.



Question

If position $x = t^2 + 5t^3 + 6$ then find

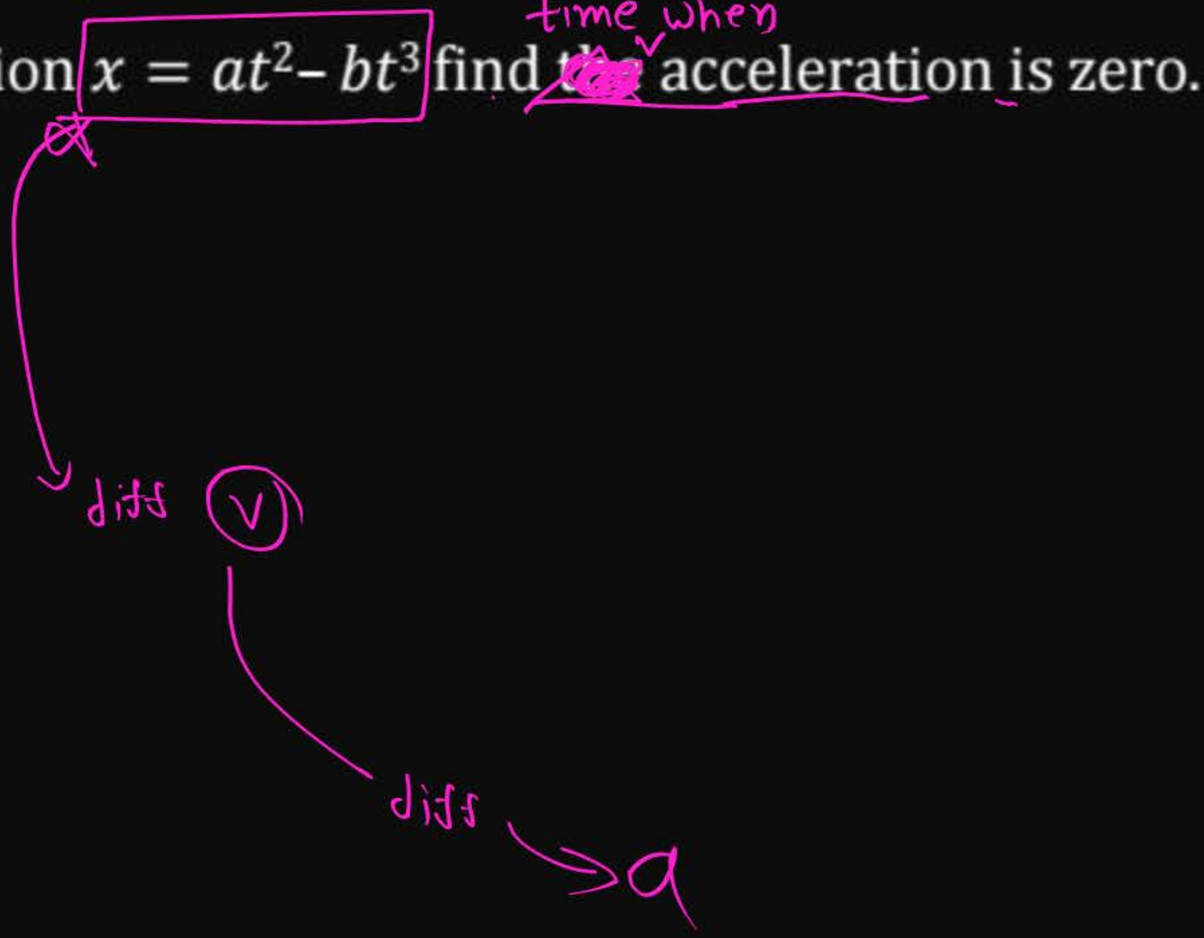
(i) Initial acceleration. ($t=0$)

(ii) Initial velocity.

(iii) Acceleration at $t = 2$ sec.

Question

If position $x = at^2 - bt^3$ find time when acceleration is zero.



Put acc = 0 & find time.

Question

The position x of particle moving along x-axis varies with time t as $x = A \sin(\omega t)$ where A and w are [redacted] positive constants. The acceleration a of particle varies with its position (x) as

1. $a = Ax$
2. $a = -\omega^2 x$
3. $a = A\,\omega\,x$
4. $a = \omega^2 x\,A$

Question

The initial velocity of a particle is u (at $t = 0$) and the acceleration a is given by $\alpha t^{3/2}$. Which of the following relations is valid?

1. $v = u + \alpha t^{3/2}$
2. $v = u + \frac{3\alpha t^3}{2}$
3. $v = u + \frac{2}{5}\alpha t^{5/2}$
4. $v = u + \alpha t^{5/2}$

$a = \alpha t^{3/2}$

Question

A particle moves along a straight line such that its displacement at any time t is given by $s = (t^3 - 6t^2 - 3t + 4)$ meters. The velocity when the acceleration is zero is

1. 3 m/s
2. 42 m/s
3. – 9 m/s
4. – 15 m/s

Question

Position of object $x = t^3 - 6t^2 + 10$. Find time when acceleration of object will be zero.

Question

Position of object $x = 2t^3 - 4t^2 + 4$. Then, find velocity, acceleration and position at $t = 2$ sec?

THANK YOU