YAKEEN NEET 2.0

2026

Basic Maths and Calculus (Mathematical Tools)

Physics | Lecture - 13

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Topics to be covered

1. H/W → already Upload ✓
2. Maxima / minima
3. log
4. Binomial Theorem

Maxima Minima and Log

Integration पूरा

(a) gf Position of object $x = t^2 - 4t + 8$ then find velocity $v = \frac{dx}{dt}$

$$V = \frac{dx}{dt} = \frac{d(t^2 - 4t + 8)}{dt}$$

$V = 2t - 4 + 0$

$V = 2t - 4$

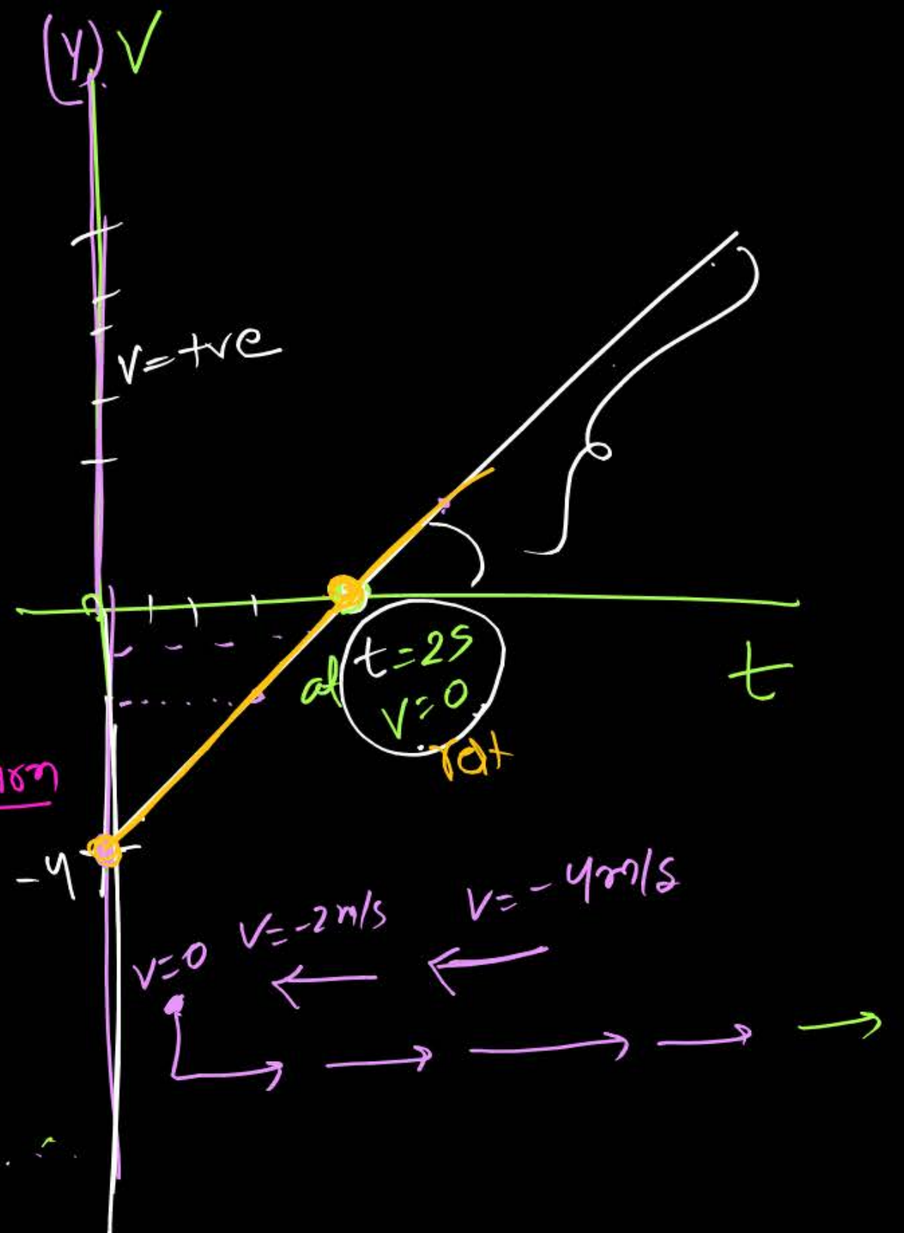
↑ $y = mx + c$

→ at $t = 2sec$, $V = 0$ → one-U turn

Velocity → How fast / where

+ve Velocity (→)

-ve (velocity) (←)



Position $x = t^2 + 4t + 6$ find v & v/t graph

Soln

$$V = \frac{dx}{dt} = 2t + 4$$

$V = 2t + 4$

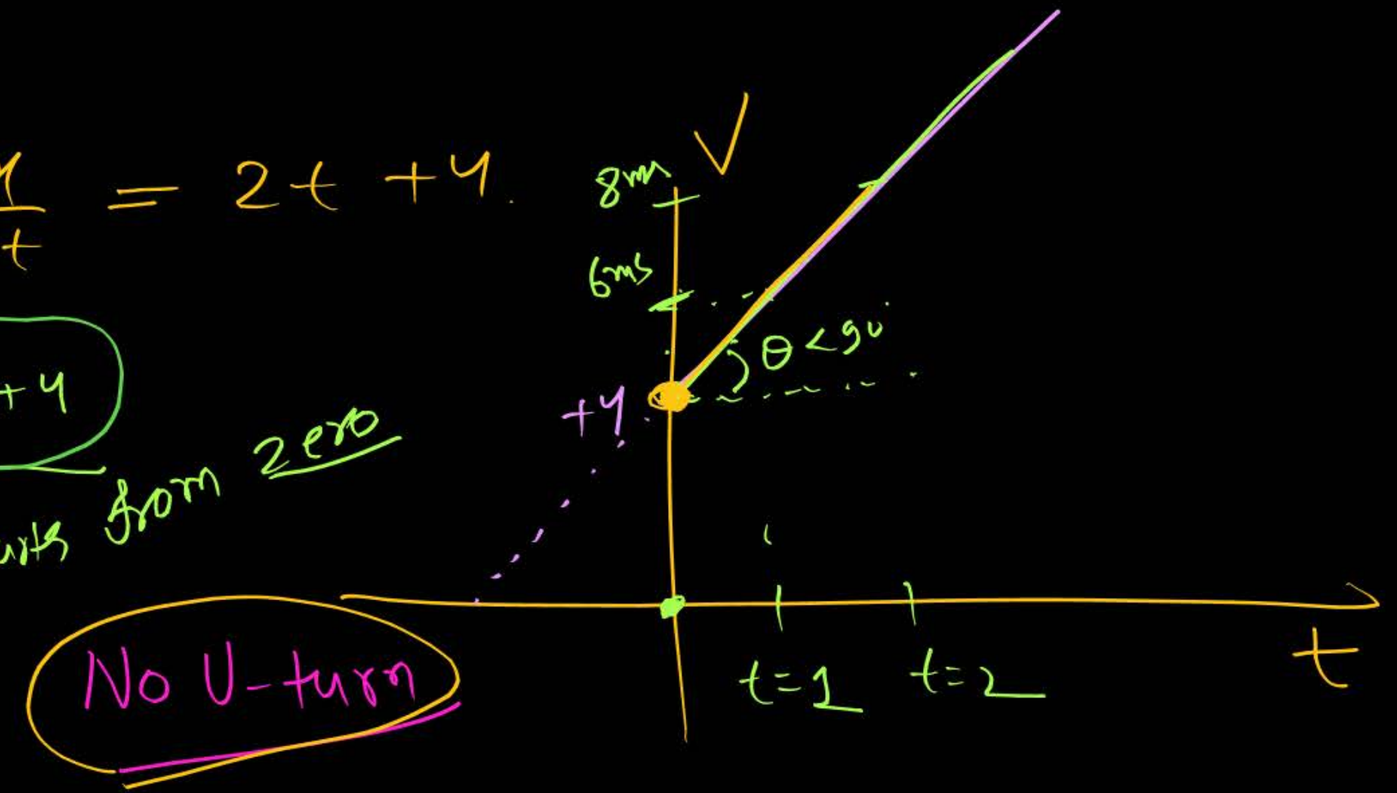
t starts from zero

Put $V = 0$

$2t + 4 = 0$

$2t = -4$

$t = -2$ ✗ Pos.



No U-turn

$$x = -t^2 - 2t + 8$$

$$\frac{dx}{dt} = V = -2t - 2$$

$V = mx + c$

no U-turn

time ko +ve rakhna hai

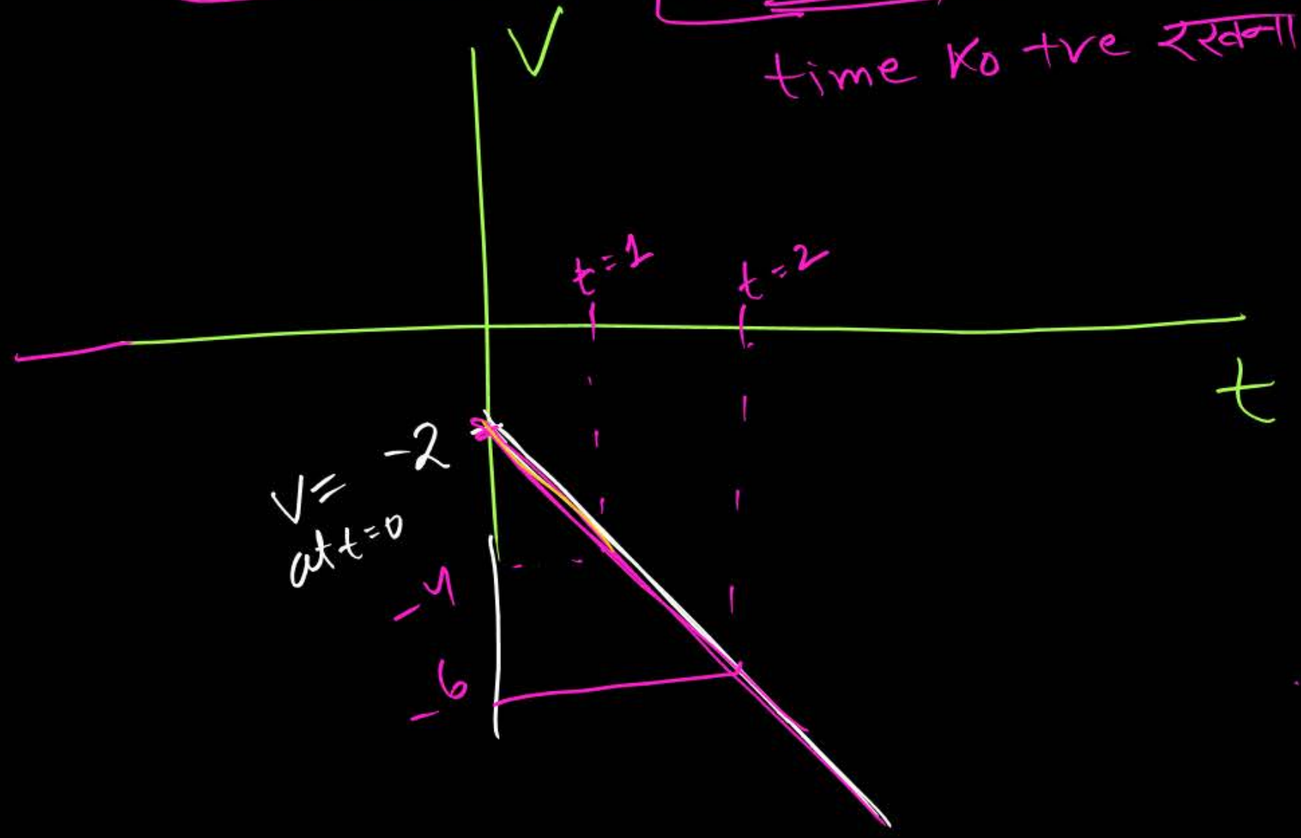
if $V = 0$

$0 = -2t - 2$

$2 = -2t$

$t = -1$

Not Possible



gf $x = \frac{t^3}{3} - 3t^2 + 8t$

find Velocity

$$V = \frac{dx}{dt} = \frac{3t^2}{3} - 6t + 8$$

$$V = +t^2 - 6t + 8$$

2 U turn

Upward Parabola

$V = t^2 - 6t + 8$

$0 = t^2 - 6t + 8$

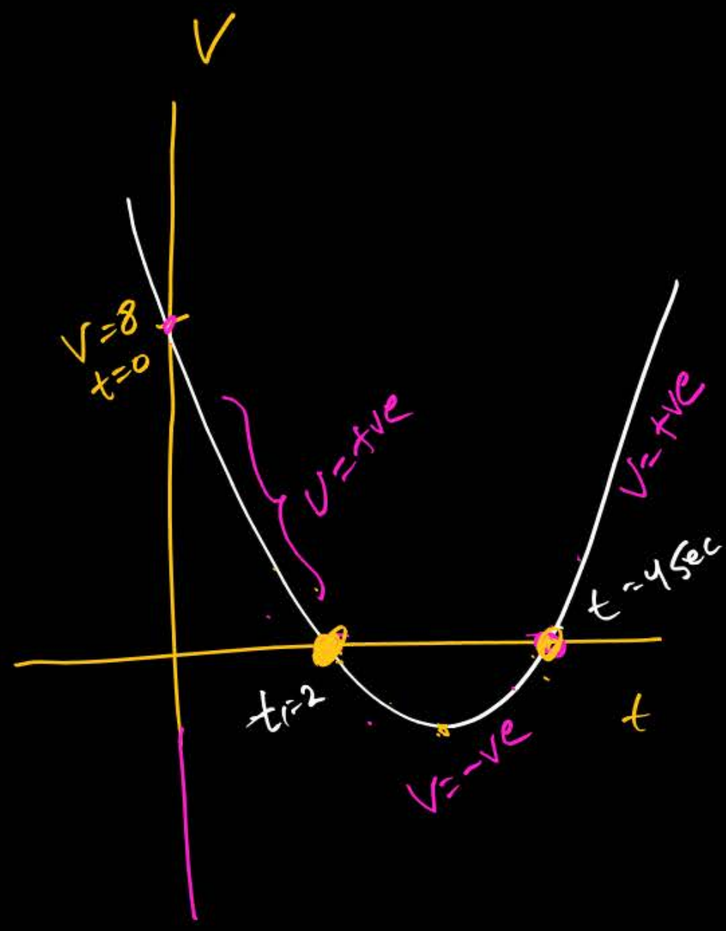
$0 = t^2 - 4t - 2t + 8$

$t(t-4) - 2(t-4) = 0$

$(t-4)(t-2) = 0$

$t_1 = +4$

$t_2 = +2$



Position. $x = \frac{t^3}{3} - 2t^2 + 4t$ find velocity & velocity time graph

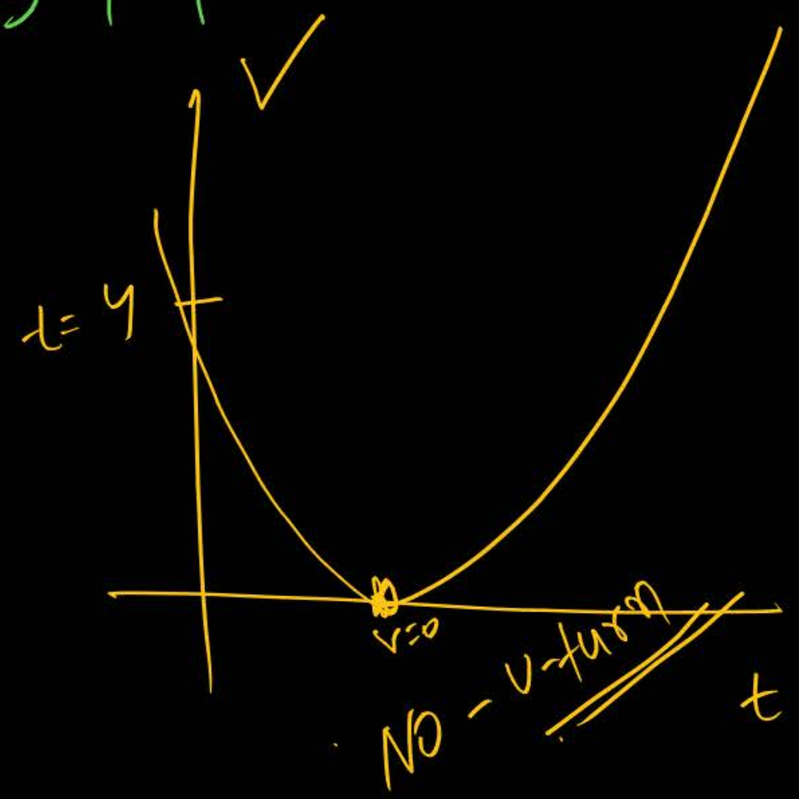
$$V = \frac{dx}{dt} = \frac{1}{3}\,3t^2 - 2(2t) + 4$$

$$V = t^2 - 4t + 4 \quad *$$

$$V = 0 = t^2 - 4t + 4$$

$$\Rightarrow t^2 - 2t - 2t + 4 = 0$$

$t_1 = t_2 =$:

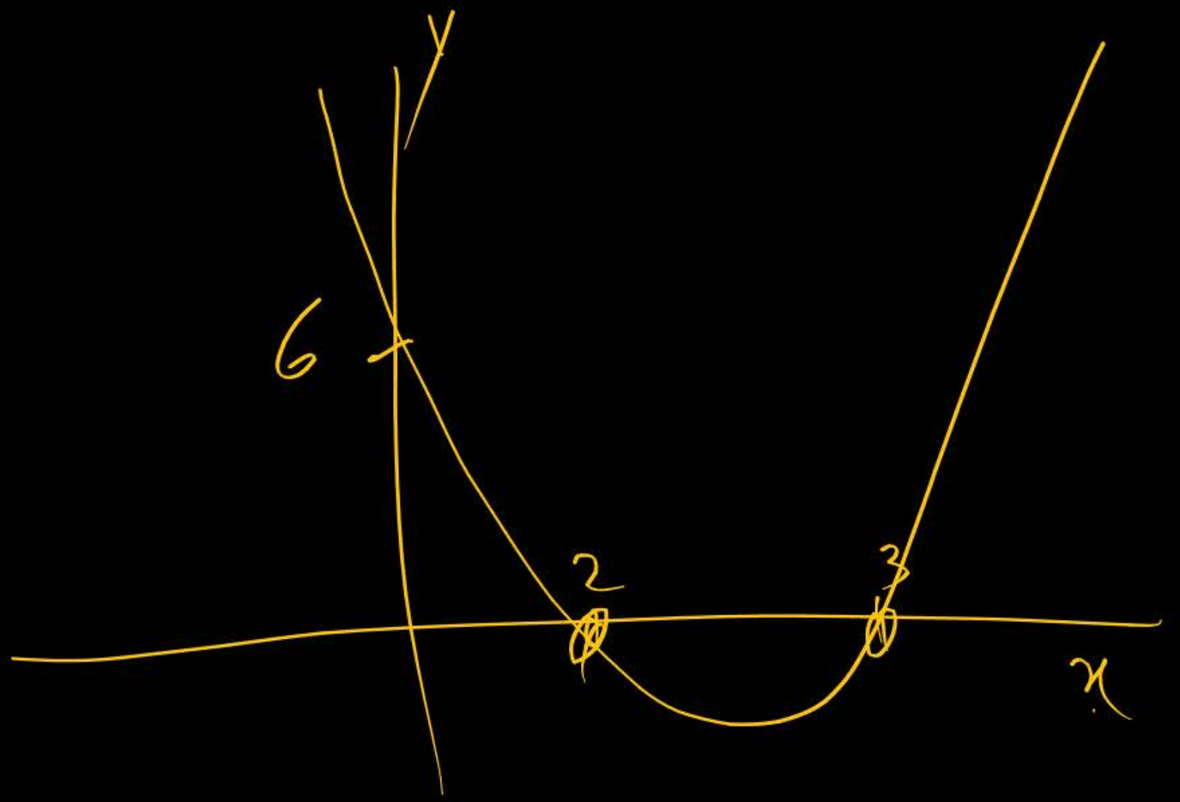


$$y = x^2 - 5x + 6$$

→ Put $y = 0$

$$x^2 - 3x - 2x + 6 = 0$$

$$x_1 = +2$$
$$x_2 = +3$$



play with graphs

Q Velocity of object is given as $\vec{V} = 3\sin(t)\,\hat{i} + 3\cos(t)\,\hat{j}$ then find distance in 2-sec.

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

$\vec{a} = \frac{d\vec{v}}{dt} = 3\cos(t)\,\hat{i} - 3\sin t\,\hat{j}$ ✓

→ 2-D motion. ✓

v → velocity variable with time ✓

a → acc^n varible with time

→ Variable acc^n ke liye integration use karte hai

→ equation of motion IVth of rolid

→ Magnitude of velocity (speed) $= \sqrt{(3\sin(t))^2 + (3\cos t)^2}$

$= \sqrt{3^2(\sin^2 t + \cos^2 t)}$ ($\sin^2 t + \cos^2 t = 1$)

$= \sqrt{9} = 3$ m/s (Constant speed)

distance = speed x time

$= 3 \times 2 = 6$m

Maxima/minima

Class Karo
Notes Bano
Revision Karo
PYQ(JEE+NEET)
With (Dpp + H.W)

→ Level-3

→ 43 to 85 Marks

→ Assignment Kar Regularly

Step-1

Class Karo
Notes Bano
Revision Karo
PYQ(JEE+NEET) Class

→ 20 Questions

→ No Dpp / No H/W

Class Karo Step-2
Notes Bano
Revision Karo
PYQ(JEE+NEET)
With (Dpp + H.W)
No assign.

→ 35-40 Questions

Maxima / minima.

at maxima.

$$\text{Slope} = \left(\frac{dy}{dx}\right)_{x_1} = 0$$

$$\left|\frac{d^2y}{dx^2}\right|_{x_1} = -ve \checkmark$$

(change in slope) = -ve

#.

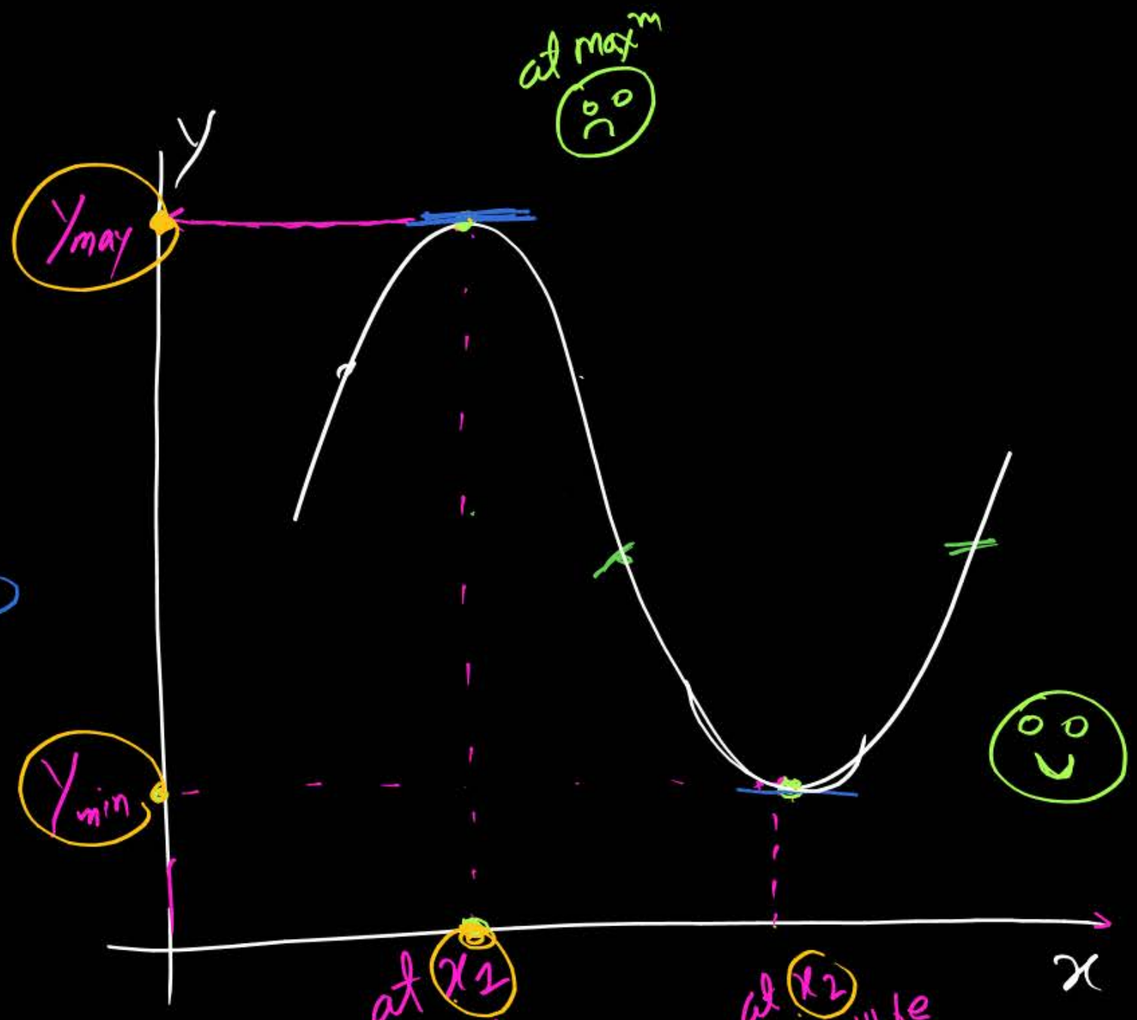
at minm.

$$\text{Slope} \left(\frac{dy}{dx}\right)_{x_2} = 0$$

Change in Slope = +ve.

$$\left(\frac{d^2y}{dx^2}\right)_{x_2} = +ve$$

#



MP* Point

(#) If slope 1 - hi place (x) par zero hai → { ya maxima / ya minima } koi ek hi rahega

If slope is zero at two value of x, x_1 and x_2 then at one x y will be maxima or at other x y will be minima.

(Q) $y = x^3 - 3x^2 + 4$ find maxima and minimum value of y. and find x where y will be maximum & minima

Soln

y will be max^m/min^m where $\left(\frac{dy}{dx}\right) = 0$ (Slope) $= 0$

Electric field E will be maximum or minimum at $\left(\frac{dE}{dx}\right) = 0$

$$\frac{dy}{dx} = 3x^2 - 3(2x) + 0$$

$$\frac{dy}{dx} = 3x^2 - 6x = 0$$

$$3x(x-2) = 0$$

$3x = 0$ $\quad (x-2) = 0$

at two value of x where $\frac{dy}{dx}$

$x_1 = 0$ $\quad x_2 = 2$

→ Put $x_1 = 0$ in y

$y = x^3 - 3x^2 + 4$

$y = 0 - 0 + 4$

$y_{\text{at } x_1=0} = +4$

↳ y_{max} at $x_1 = 0$

Put $x_2 = 2$

$y = 2^3 - 3(2)^2 + 4$

$= 8 - 3\times 4 + 4$

$= 12 - 12 = 0$

$y_{\text{at } x_2=2} = 0$

↳ y_{min} at $x_2 = 2$

gf Velocity of object $V = t^3 - 6t^2 + 12$ then find maximum and minimum value of velocity.

$V = t^3 - 6t^2 + 12$

V will be max^m or min^m $\frac{dv}{dt} = 0$

$\left(\frac{dv}{dt}\right) = 3t^2 - 12t + 0$

$3t^2 - 12t = 0$

$3t(t-4) = 0$

$t_1 = 0$, $t_2 = 4$

direct MTR *

mid step double diff

$\frac{d^2V}{dt^2} = 3(2t) - 12$

$\frac{d^2V}{dt^2} = 6t - 12$

check $\frac{d^2V}{dt^2}$ at $t=0$ & $t=4$

$\left|\frac{d^2V}{dt^2}\right|_{t=0} = -12$ max

$\left|\frac{d^2V}{dt^2}\right|_{t=4} = +12$ min

Put $t_1 = 0$ in velo

$V_{max} = +12$ → $t_1 = 0$

Put $t_2 = 4$ in velocity

$V = 4^3 - 6(4)^2 + 12$

$= 64 - 6 \times 16 + 12$

$= 76 - 96$

$V_{minima} = -20$

at $t_2 = 4$

find Maxima and Minima of $y = x^2 + 5$

y will be max^m or min^n at $\frac{dy}{dx} = 0$

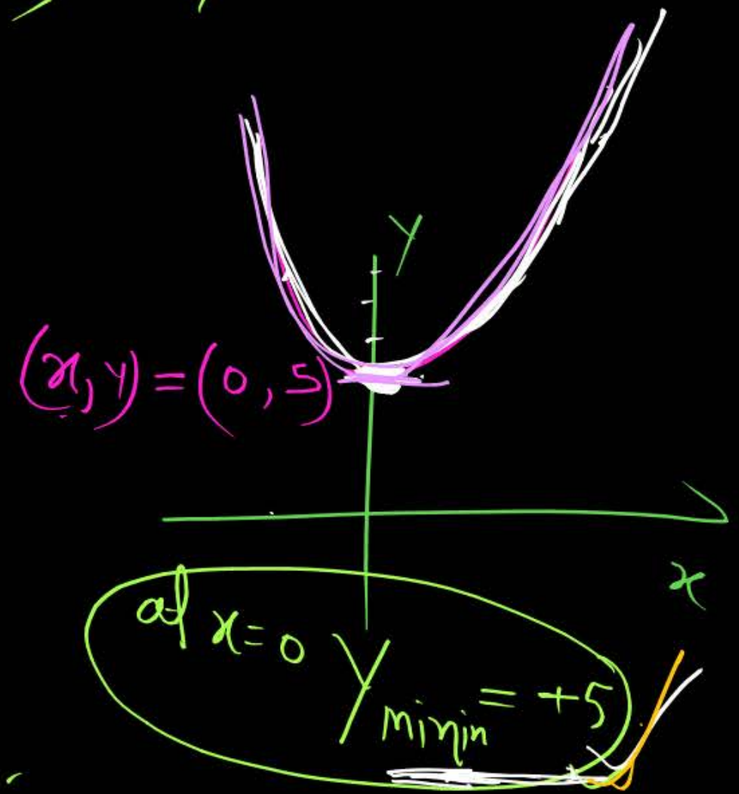
$\frac{dy}{dx} = 2x + 0 = 0$

$2x = 0$

$x = 0$ → slope is zero at $x = 0$

$\frac{d^2y}{dx^2} = +2$ minm

Maxima ya minin me se koi ek hoga



at $x = 0$ $y_{minin} = +5$

Find Maxima and minima of $y = x^2 - 4x + 5$ then find maxima and minima of 'y'.

upward ||

Soln $y = x^2 - 4x + 5$

$$\frac{dy}{dx} = 2x - 4 + 0$$

$$\frac{dy}{dx} = 0 = 2x - 4$$

$$x = \frac{4}{2} = +2$$

double

$\frac{d^2y}{dx^2} = +2$ (+ve) → minimum

slope is zero at one point

$y_{(x=0)} = 5$

$y_{(x=2)} = 4 - 4\times 2 + 5$

$= 9 - 8 = +1$

y_{min}

upward parabola (y_{min})

If $y(x)$ → upward Parabola → y_{min}

If $y(x)$ downward Parabola → y_{max}

(2) $y = x^3 - 12x^2 + 36x$ find maximum & minimum y.

Soln y will be max^m / min^m at $\frac{dy}{dx} = 0$

$\Rightarrow \left(\frac{dy}{dx}\right) = 0 = 3x^2 - 24x + 36$

$3x^2 - 24x + 36 = 0$

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

$x^2 - 8x + 12 = \frac{0}{3} = 0$

$x^2 - 6x - 2x + 12 = 0$

$x(x-6) - 2(x-6) = 0$

$(x-6)(x-2) = 0$

$x_1 = +6$

$x_2 = +2$

Put $x_1 = 6$ in y

$y = 6^3 - 12(6)^2 + 36 \times 6$

$= 216 - 12 \times 36 + 216$

$y_{min} = 432 - 432 = 0$

$y_{min} = 0$ at $x_1 = 6$

$y_{max} = 32$ at $x_2 = 2$

Put $x_2 = 2$ in y

$y = 2^3 - 12(2)^2 + 36 \times 2$

$y_{max} = 8 - 12 \times 4 + 72$

$y_{max} = 80 - 48 = +32$

Concept of Powe2

$1^8 = 1$

$2^0 = 1$

$2^1 = 2$

$2^2 = 4$

$2^3 = 8$

$2^4 = 16$

$2^5 = 32$

$3^0 = 1$

$3^1 = 3$

$3^2 = 9$

$3^3 = 27$

$3^4 = 81$

$3^5 = 243$

$4^0 = 1$

$4^1 = 4$

$4^2 = 16$

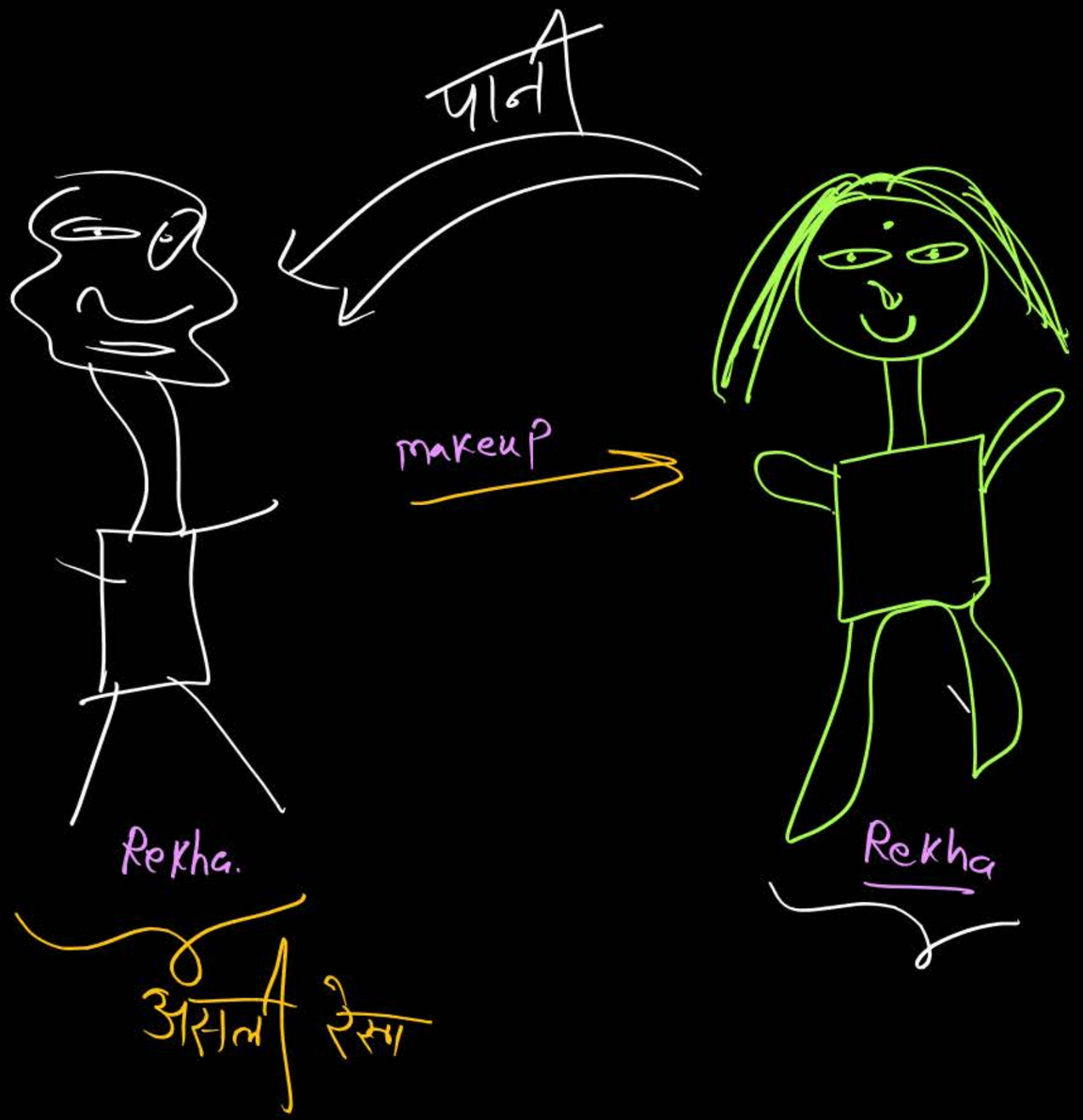
$4^3 = 64$

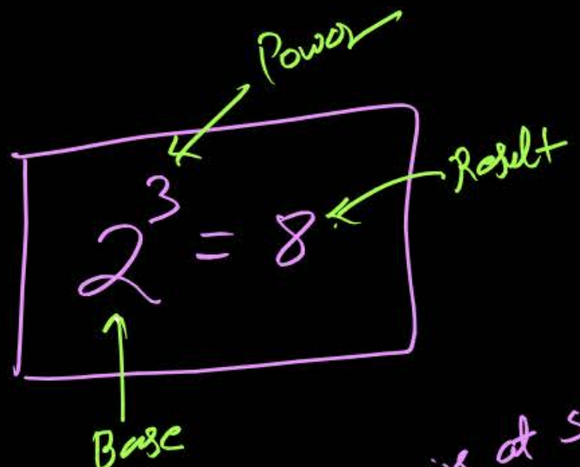
$4^4 = 256$

$5^0 = 1$

$5^2 = 25$

$5^3 = 125$

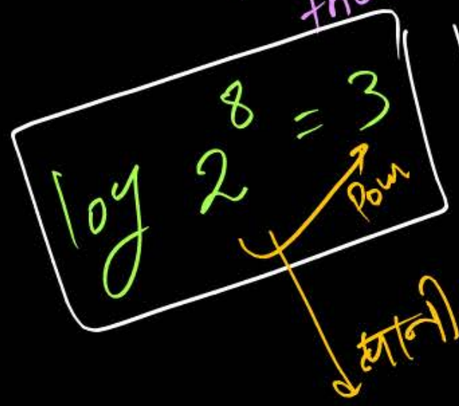




Base remains at same Position
Result ⇌ Power interchange
their Position.

$\log_2 8 = 3$

log 8 on the Base 2



$2^3 = 8$

Q $\log_4 64 = ??$ x (1st) Power

पानी

$4^x = 64$

$4^x = 4^3$

$x = 3$ Ans

++ $\log_3 27 = x$

find x

$3^x = 27$

$3^x = 3^3$

$x = 3$

(Q) $\log_{10}^{x} = 4$

(Base)

find $x = ??$

$10^4 = x$

$\boxed{x = 10^4 = 10000}$

A

$\log_{x}^{100} = 2$

(Base)

find x.

$\boxed{x^2 = 100}$

$(x = 10)$ Ans

⊛ $\log_y x = z$ ⟶ log y ka power x is equal to z

✗

⟶ log x on the base y is equal to z

✓

✳

$\log_{\text{Power}} \text{Power} = 1$

Property of log :—

Rule - 1 → If value of log & Base is same then result will be 1.

$\log_e e = 1$ (Base)

$\log_{\text{Ramlal}} \text{Ramlal} = 1$

$\log_x x = 1$

$\log_{10} 10 = 1$

$\log_4 4^1 = 1$ (Base, Power)

Rule 2

$\log_e 1 = 0$

$\log_{10} 1 = x = 0$

पानी मार के सीधा

$10^x = 1$

$x = 0$

⇒ log 1 on the any Base (which is not equal to zero or 1) = 0 ✓

$\log_1 1 = 1$

$\log_2 1 = 0$

$\log_8 1 = 0$

$\log_{10} 1 = 0$

Rule ③

$$\log e^{(x+y)} = \log e^{x} + \log e^{y}$$

$$\log_{10}^{(xy)} = \log_{10}^{x} + \log_{10}^{y}$$

$$10^{x} \times 10^{y} = 10^{x+y}$$

$$e^{x} \times e^{y} = e^{x+y}$$

Rule - ④

$$\log_e\left(\frac{x}{y}\right) = \log e^{x} - \log e^{y}$$

$$\log_{10}\left(\frac{x}{y}\right) = \log_{10}^{x} - \log_{10}^{y}$$

Rule - 5

$\log_e (x)^n$ = log x ka Power n on the Base (e).

$$\log_e (x^n) = n \log_e x$$

- $\log e^{25} + \text{Log}\, e^{4} - \log e^{10} =$

11/ω

Question

Find value of given expression:

$$\log_{10}(4 \times 10^{-4})$$

HW

- $\log_{10}(\sin\theta \cdot \operatorname{cosec}\theta)$
- $\log_{10} 25 + \log_{10} 40$
- $\log_{10} 200 - \log_{10} 2 =$
- $\log_{10} 200 =$

H/w

$\log 8^{16} =$

$\log_{27}^{3} =$

$\lg 10^{1000} =$

H/W $\log_{1000}^{10} =$

- $\log_8 16 =$
- $\log_{27} 3$
- $\log_{100} 1000 =$
- $\log_{10} (0.0001) =$
- $\text{Log}_{0.01} 10 =$

H/w

$\log_{10} 0.001^{10} =$

$\log_{0.1} 10^{10} =$

$\log_{64} 2^{2} =$

H/W $\log_{\frac{1}{4}} 16^{1/16} =$

THANK YOU