Nishant Jindal

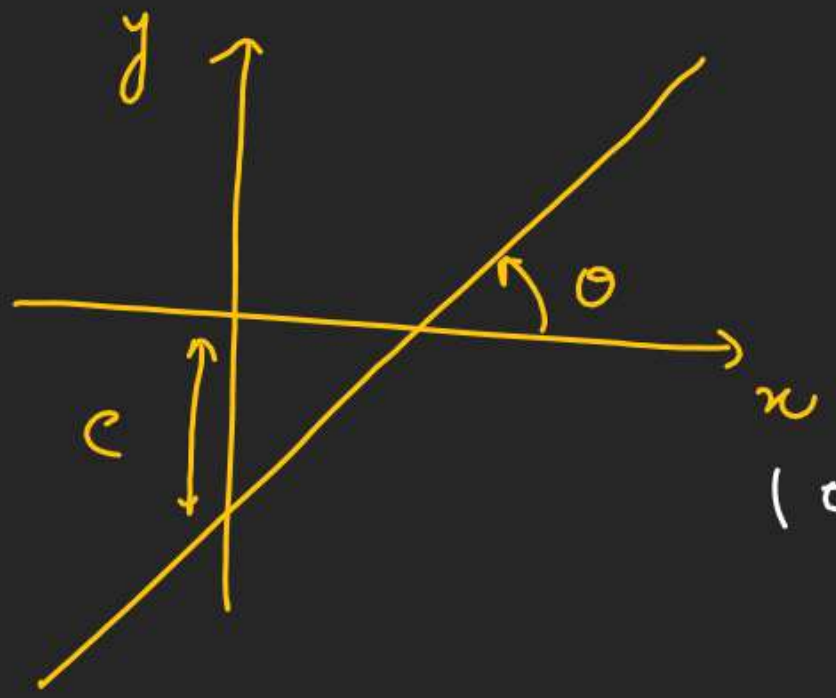
Basic Maths (Physics)

Linear function

$$\boxed{y = mx + c}$$

$\Downarrow$

St-line

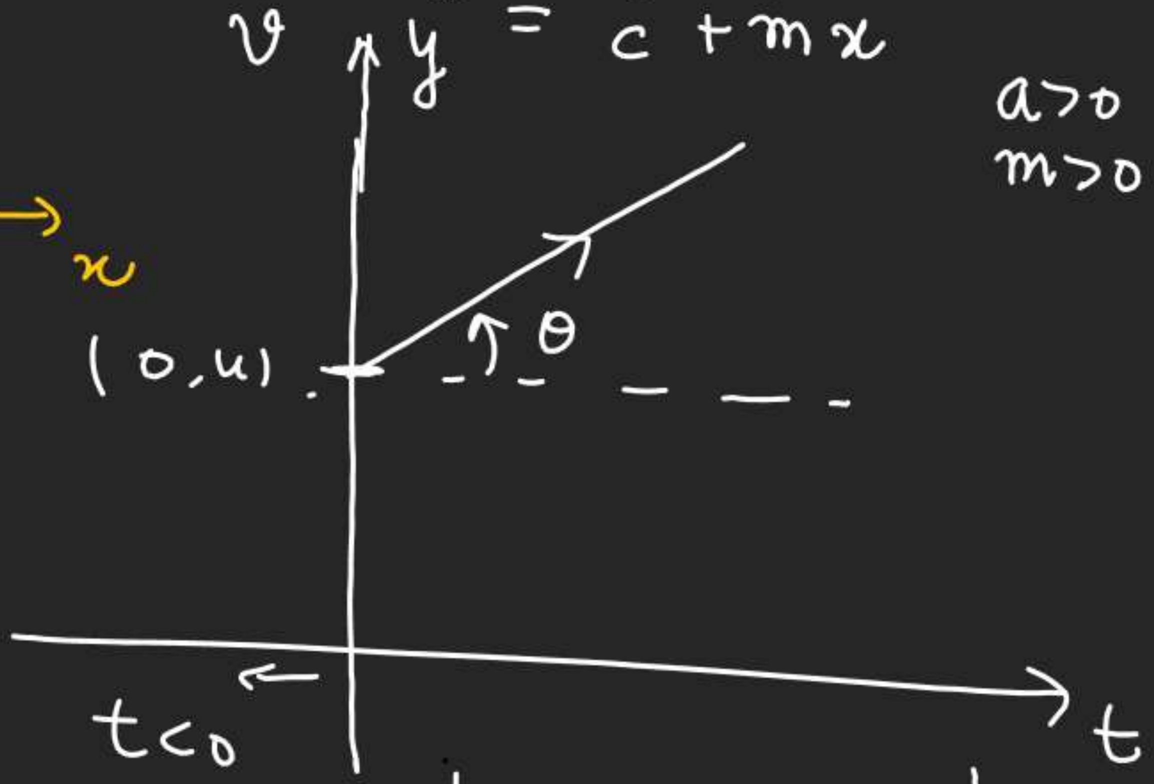


$m = \tan\theta \rightarrow$ Slope of St-line

$C =$ Intercept on y-axis

$\Rightarrow \boxed{v = u + at}$

$y = c + mx$



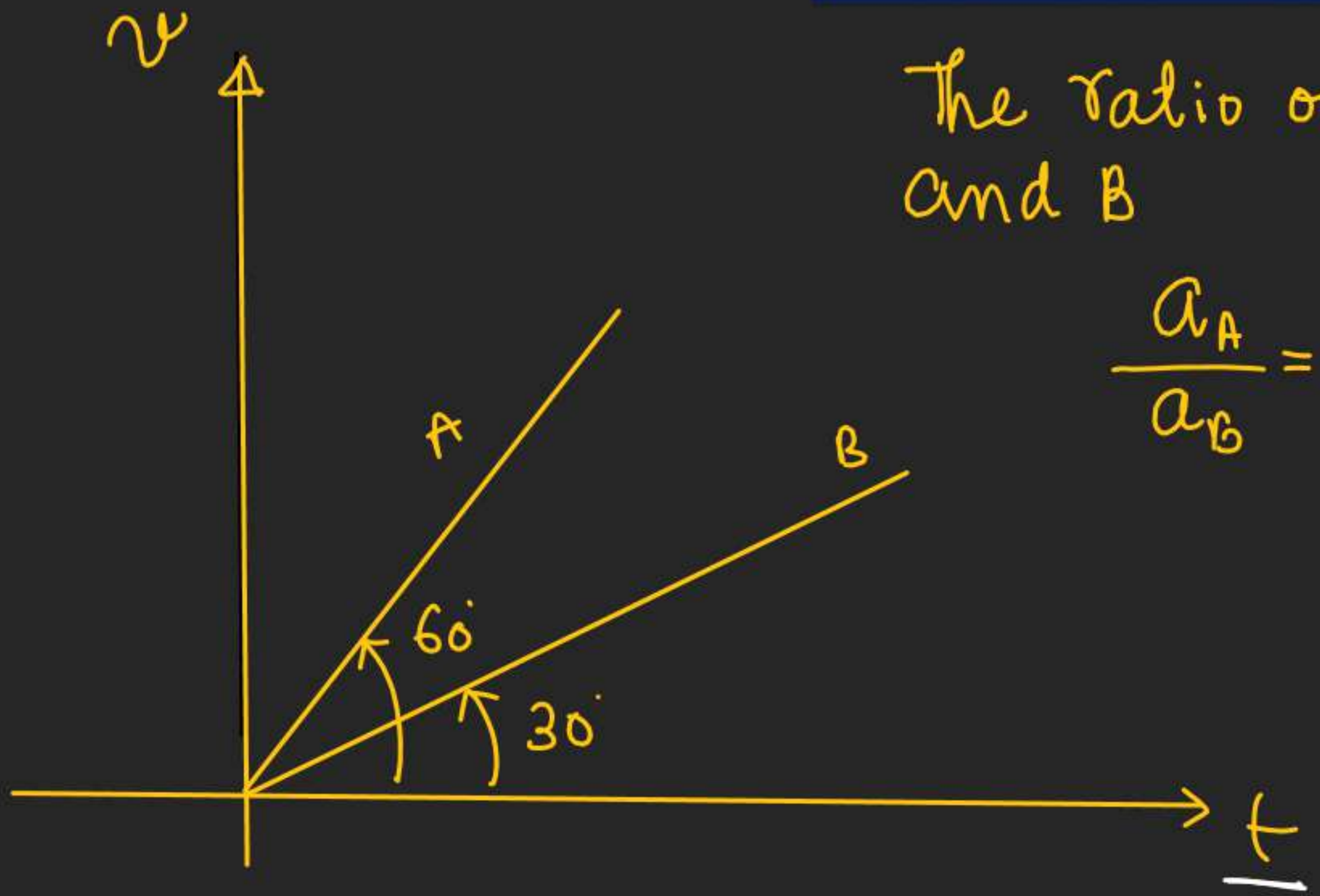
$a > 0$

$m > 0$

$\tan\theta = \text{Slope} = \text{'}a\text{'}$

Nishant Jindal

Basic Maths (Physics)



The ratio of accleration of particle A and B

$$\frac{a_A}{a_B} = ??$$

$$\boxed{\begin{aligned}\tan 30° &= \frac{1}{\sqrt{3}} \\ \tan 60° &= \sqrt{3}\end{aligned}}$$

Slope of v-t graph gives accleration.

$v = u + a t$

$y = c + m x$

$\boxed{m = a}$

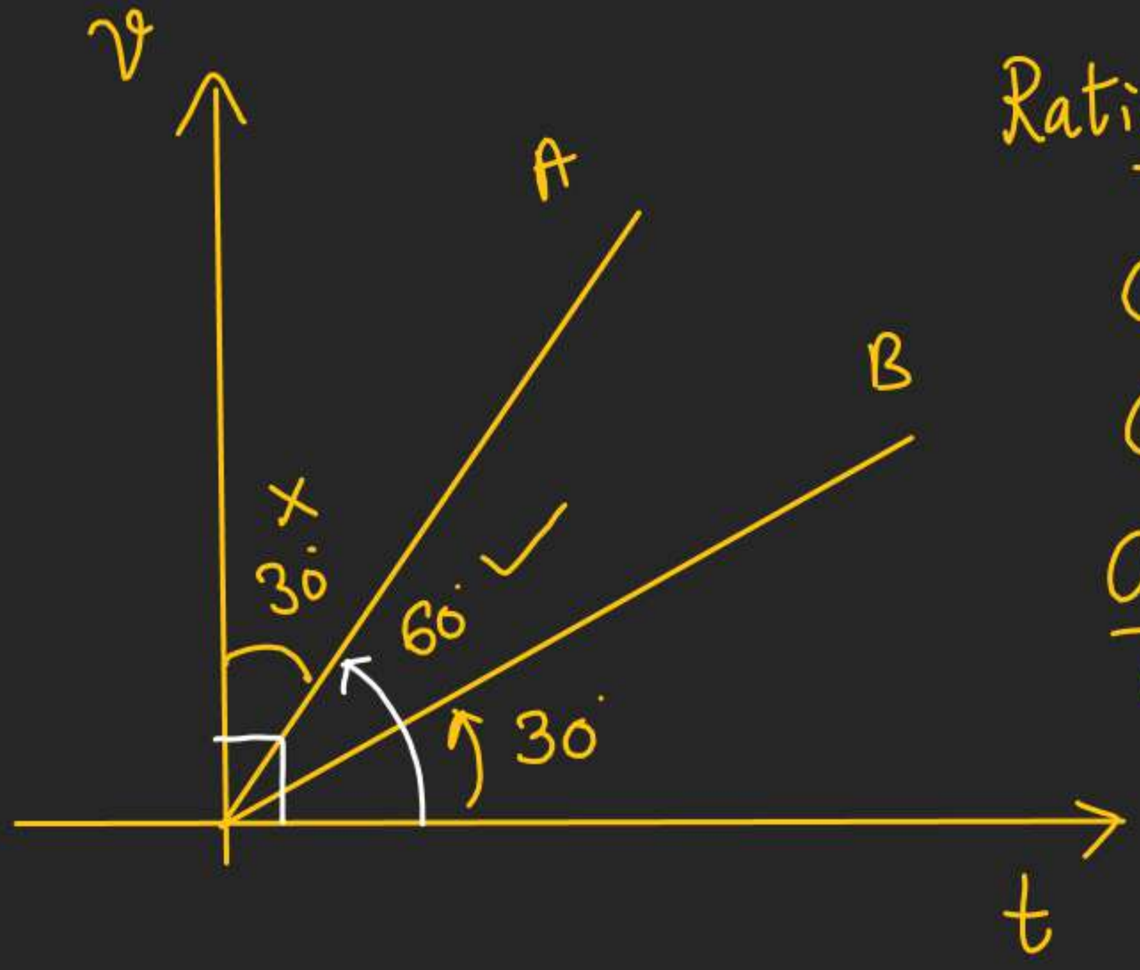
$a_A = \tan 60° = \sqrt{3}$

$a_B = \tan 30° = \frac{1}{\sqrt{3}}$

$$\frac{a_A}{a_B} = \frac{\sqrt{3}}{1/\sqrt{3}} = \underline{3:1}$$ ✓

Nishant Jindal

Basic Maths (Physics)



Ratio of acclerations of a_A and a_B

$a_A = \tan 60° = \sqrt{3}$

$a_B = \tan 30° = \frac{1}{\sqrt{3}}$

$\frac{a_A}{a_B} = 3:1$

Nishant Jindal

Basic Maths (Physics)

Quadratic Equation :-

↳ Polynomial function having degree '2'

$$\boxed{y = ax^2 + bx + c}$$

y → Dependent Variable

x → Independent

a, b & c ⇒ Constant

graph → $\boxed{\text{U} \to \text{Shape}}$

↳ Parabola

How to trace :-

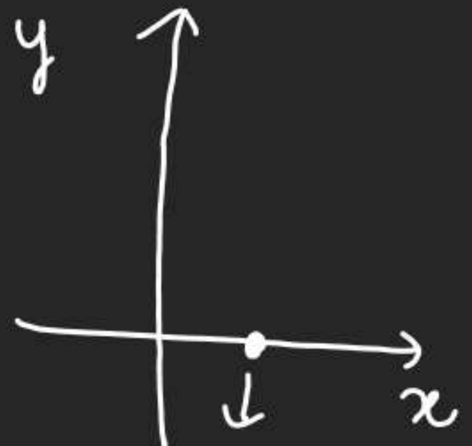
⇒ ① Check D.

$D = (b^2 - 4ac)$

if $\boxed{D > 0}$ ⇒ It has two real unequal roots

$\boxed{D = 0}$ ⇒ It has two equal roots

$\boxed{D < 0}$ ⇒ No real roots or Imaginary roots



y-cordinate alway zero on x- axis.

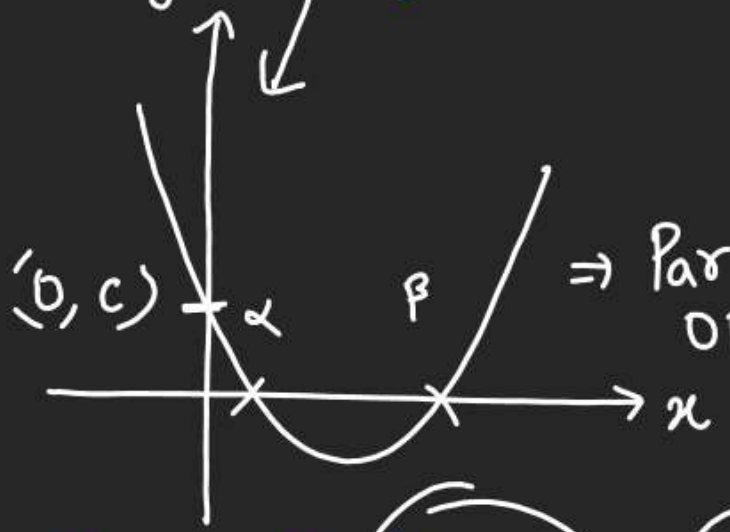
Nishant Jindal

Basic Maths (Physics)

Case - 1

If $D > 0$, $(a > 0)$

two real Unequal roots.



for $x = 0$
$y = c$

$\Rightarrow$ Parabola opening upward.

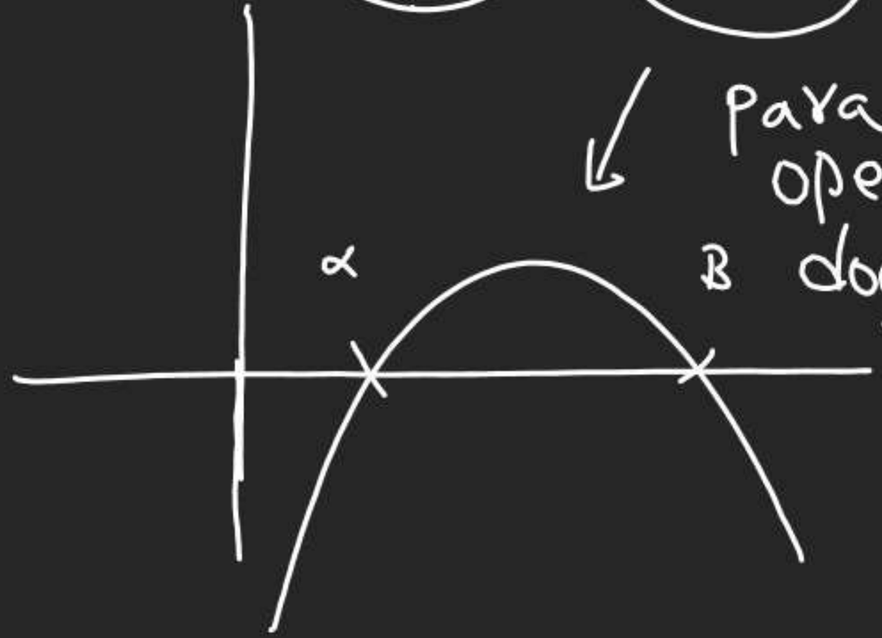
$\Rightarrow y = ax^2 + bx + c$

$a = \text{coff}^n \text{ of } (x^2)$

If $a > 0 \Rightarrow$ Parabola Opening upward.

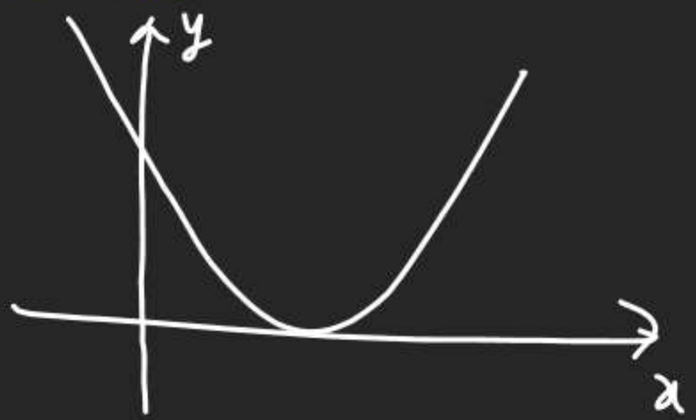
$a < 0 \Rightarrow$ Parabola opening downward.

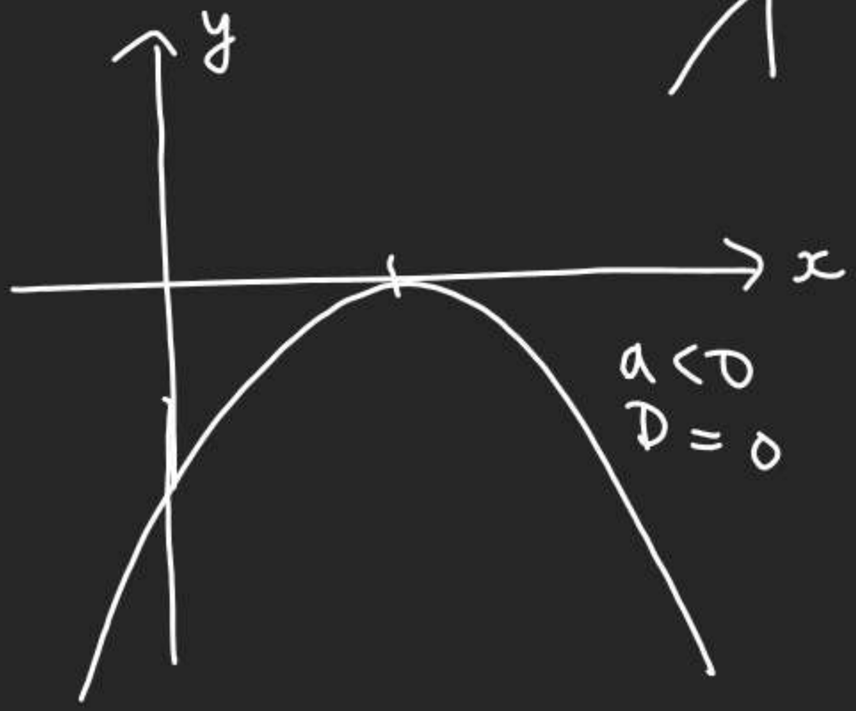
Case :- 2 $D > 0$ $a < 0$



Parabola opening downward.

Cas- 3 If $D = 0$, $a > 0$





$a < 0$
$D = 0$

Case - 4

$D < 0$ $a > 0$

$D < 0$
$a < 0$

Nishant Jindal

Basic Maths (Physics)

Trace

a) $y = (4x^2 - 2x)$ $a = 4 > 0$

$y = ax^2 + bx + c$

$a = 4,\ b = -2,\ c = 0$

Roots $\boxed{y = 0}$

$4x^2 - 2x = 0$

$x(4x - 2) = 0$

$\boxed{x = 0}$ $\boxed{x = \frac{1}{2}}$

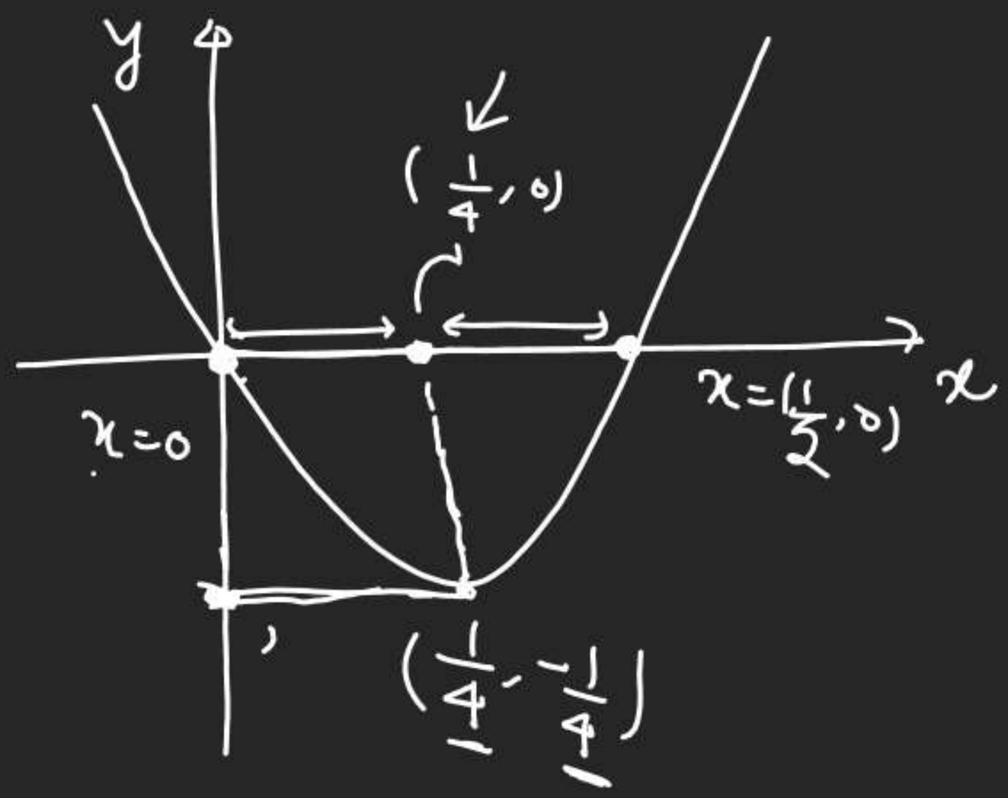
$4x^2 - 2x = 0$

$2x(2x - 1) = 0$

$x = 0,\ x = \frac{1}{2}$

Here $a > 0$

Parabola opening upward



For y intercept, put $x = 0$

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

$y = 4x^2 - 2x$

At $x = (\frac{1}{4})$

$y = 4 \times (\frac{1}{4})^2 - 2 \times (\frac{1}{4})$

$= \frac{1}{4} - \frac{1}{2}$

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

Nishant Jindal

Trace the Curve

a) $y = (1)x^2 - x - 6$

Roots, $y = 0$

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

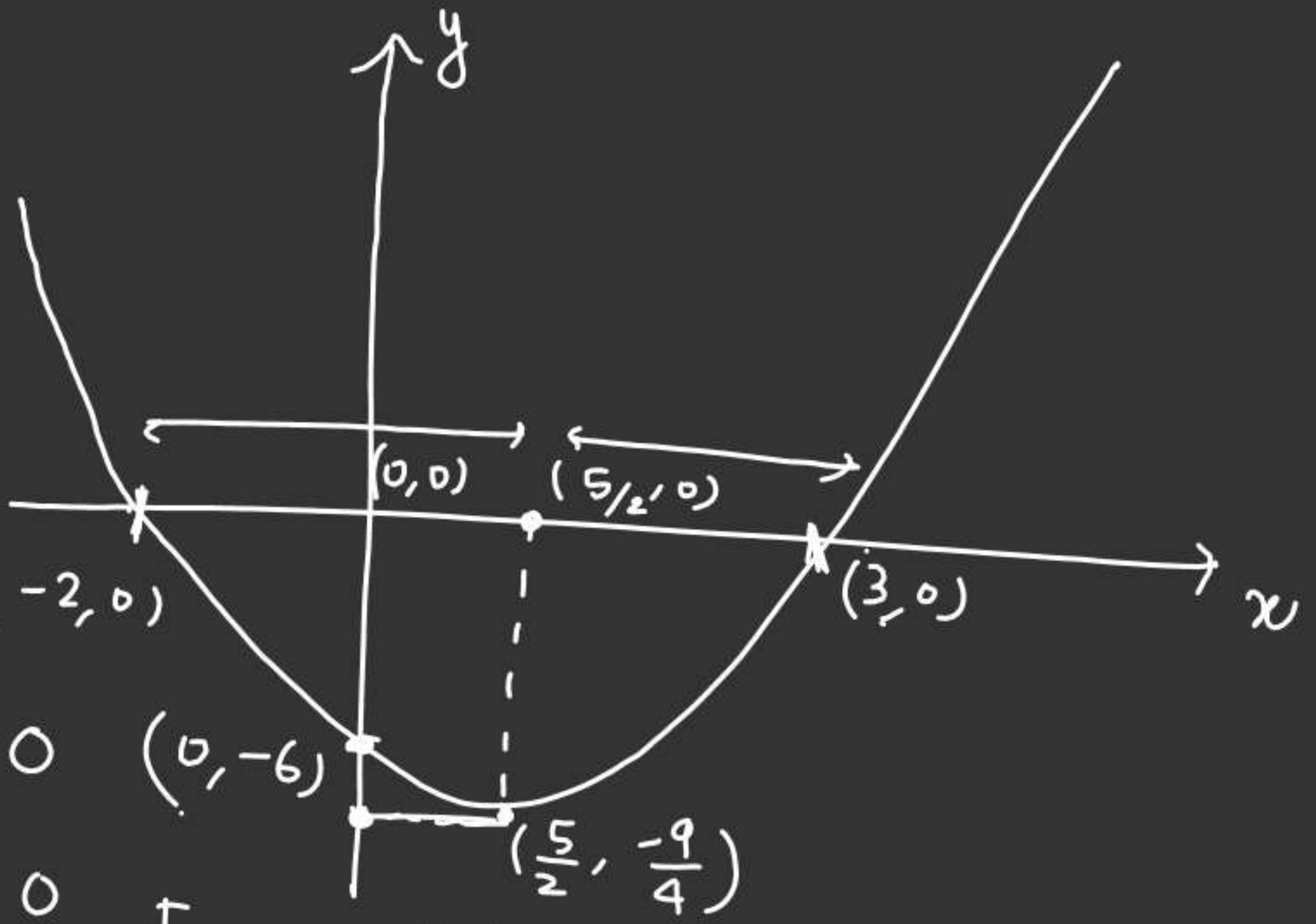
$$x^2 - 3x + 2x - 6 = 0$$

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

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

$$\boxed{x = -2, \quad x = 3}$$

$$\boxed{a > 0}$$



For y → intercept

$x = 0$, $y = -6$

$$y = \left(\frac{5}{2}\right)^2 - \left(\frac{5}{2}\right) - 6$$

$$= \frac{25}{4} - \frac{5}{2} - 6 = \frac{25 - 10 - 24}{4} = \frac{25-34}{4} = \frac{-9}{4}$$

Nishant Jindal

2^{nd} Equation of Kinematics

$$\boxed{S = ut + \frac{1}{2}at^2} \Rightarrow \boxed{S = f(t)}$$

→ Displacement as a function of time

u = Initial velocity ⇒ Constant

a = accleration ⇒ $\boxed{a = \text{Constant}}$

$$\boxed{a > 0}$$

Coffⁿ of $t^2 > 0$

Roots

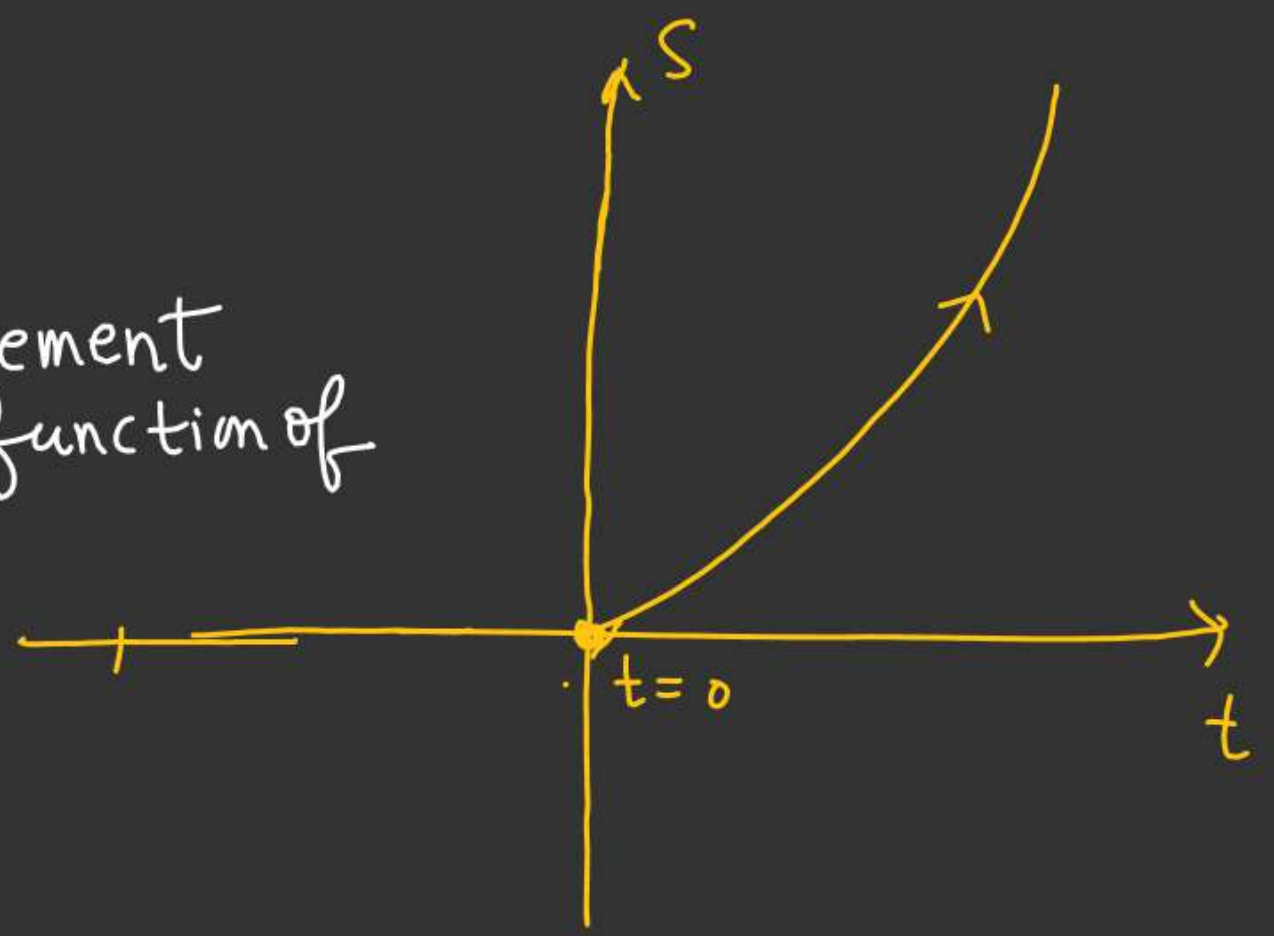
$$S = 0$$

$$ut + \frac{1}{2}at^2 = 0$$

$$t\left(u + \frac{1}{2}at\right) = 0$$

$$t = 0, \quad u + \frac{1}{2}at = 0$$

$$t = \left(-\frac{2u}{a}\right)$$



Nishant Jindal

$S = (4t^2 - 4t + 1)$

(Displacement of a particle as a function of time)

Roots

$S = 0$

$4t^2 - 4t + 1 = 0$

$4t^2 - 2t - 2t + 1 = 0$

$2t(2t-1) - 1(2t-1) = 0$

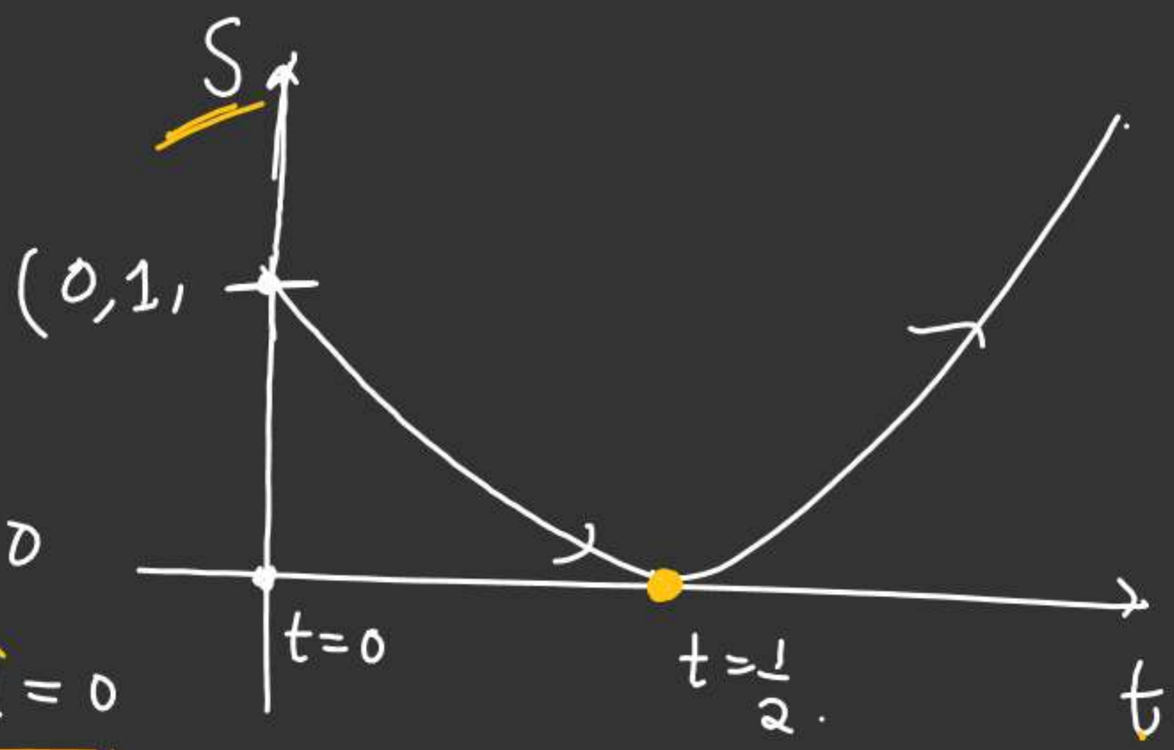
$(2t-1)(2t-1) = 0$

$\boxed{t = \frac{1}{2}}$

$S = 4\left(\frac{1}{2}\right)^2 - 4\left(\frac{1}{2}\right) + 1$

$= 1 - 2 + 1$

$= 2 - 2 = 0$



At $t=0$, $S = ??$

$\boxed{S = +1}$