

Q A Poly f'n satisfies Cond"

$$f(x+1) = f(x) + 2x + 1. \text{ Find } f(x)$$

If  $f(0) = 1$ . Find also the eqn.

of pair of tangents from origin

& Compute area enclosed by  
Curves & Pair of tangents.

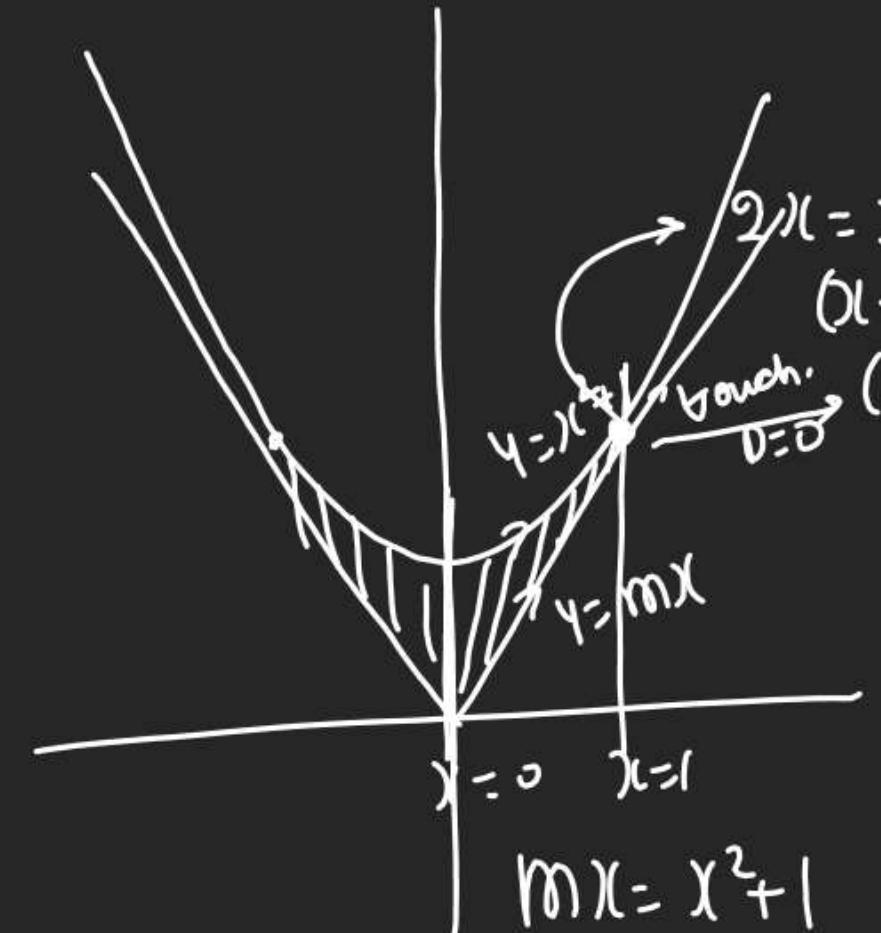
$$f(x+1) = f(x) + 2x + 1$$

$$x=0 \quad f(1) = f(0) + 1 = 1 + 1 = 2 = 1^2 + 1$$

$$x=1 \quad f(2) = f(1) + 2 + 1 = 5 = 2^2 + 1$$

$$x=2 \quad f(3) = f(2) + 5 = 10 = 3^2 + 1$$

$$f(x) = x^2 + 1$$



$$m)x = x^2 + 1$$

$$x^2 - mx + 1 = 0$$

$$D=0$$

$$m^2 - 4 = 0$$

$$m = \pm 2$$

$$\therefore y = 2x$$

$$\therefore \text{Area} = 2 \int_0^1 x^2 + 1 - 2x \, dx$$

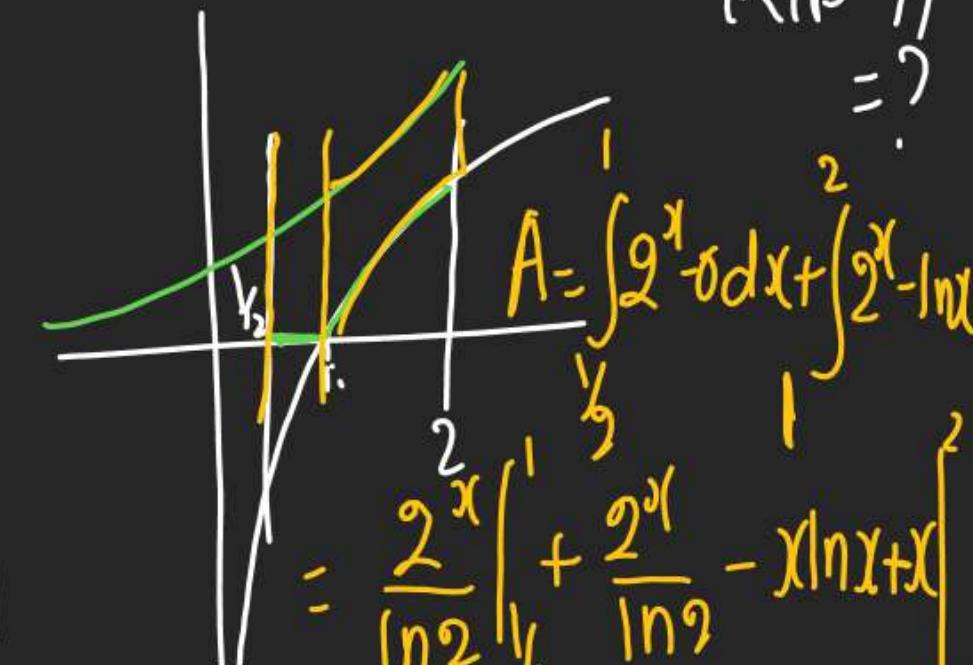
$$= 2 \int_0^1 (x-1)^2 \, dx = 2 \left[ \frac{(x-1)^3}{3} \right]_0^1 = 0 - \left[ \frac{2}{3} \right] = \frac{2}{3}$$

Q Area of Region Bounded

$$R = \{(x, y) : \max\{0, \ln x\} \leq y \leq 2\}$$

;  $\frac{1}{2} \leq x \leq 2$  is green

$$\alpha(\ln 2)^{-1} + \beta(\ln 2) + \gamma \text{ then } (\alpha + \beta - \gamma)^2 = ?$$

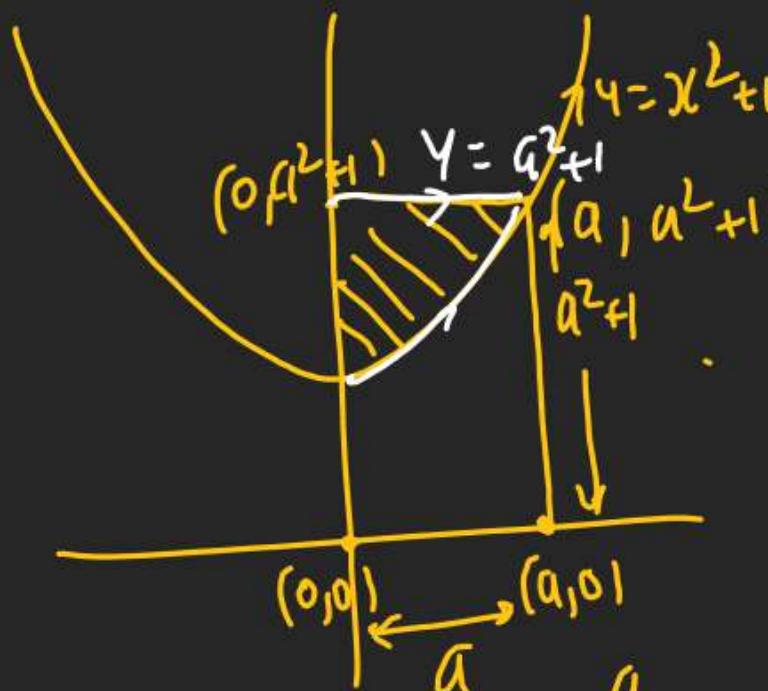


Solve & get  $\alpha, \beta, \gamma$

Q +ve value of  $a$  for which Parabola.

$y = x^2 + 1$  bisects area of rectangle.

(with vertices  $(0,0)$ ,  $(a,0)$ ,  $(a, a^2+1)$ ,  $(0, a^2+1)$ )



$$\text{Area} = a(a^2+1) = 2 \int_{0}^{a^2+1} (a^2+1) - (x^2+1) dy$$

$$a(a^2+1) = 2 \left[ a^2(x) \right]_0^{a^2+1} - \left[ \frac{x^3}{3} \right]_0^{a^2+1}$$

$$a^3 + a = 2 \left[ a^3 - \frac{a^3}{3} \right] = \frac{4a^3}{3} \Rightarrow a = \frac{a^3}{3} \Rightarrow a = \sqrt[3]{3}$$

$\underline{\Omega}$  Region Rep. by

$$|x-y| \leq 2 \quad \& \quad |x+y| \leq 2$$

$$-2 \leq x-y \leq 2 \quad \& \quad -2 \leq x+y \leq 2$$

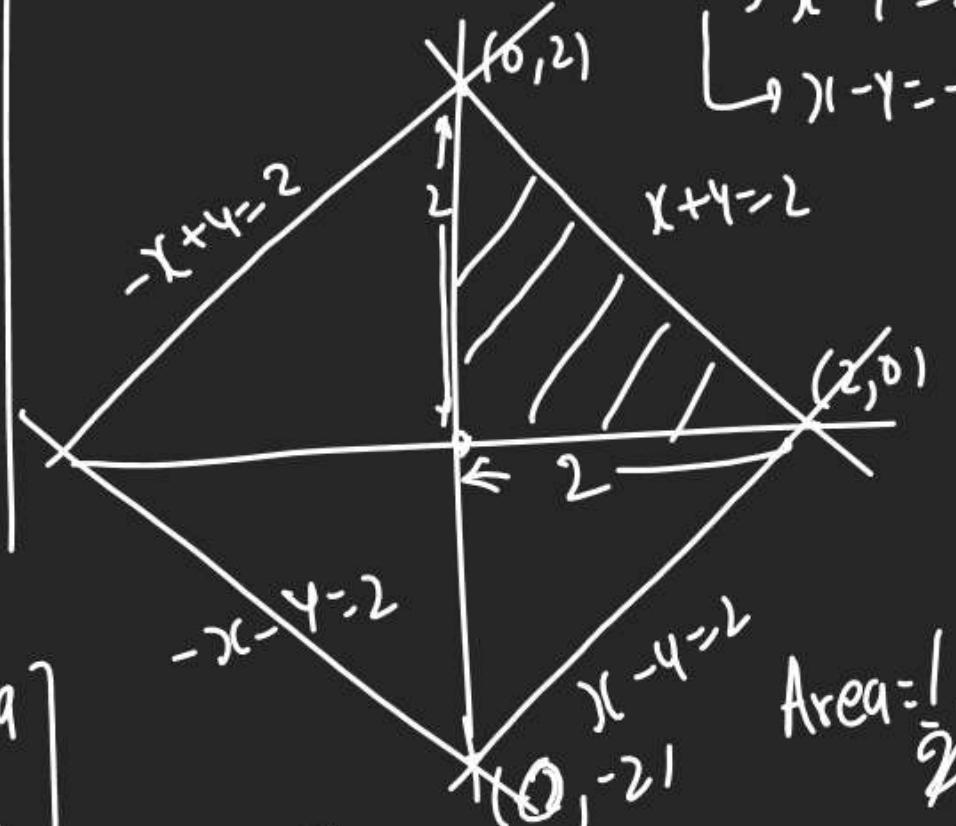
4 lines here.

$$x+y=2$$

$$x+y=-2$$

$$x-y=2$$

$$x-y=-2$$



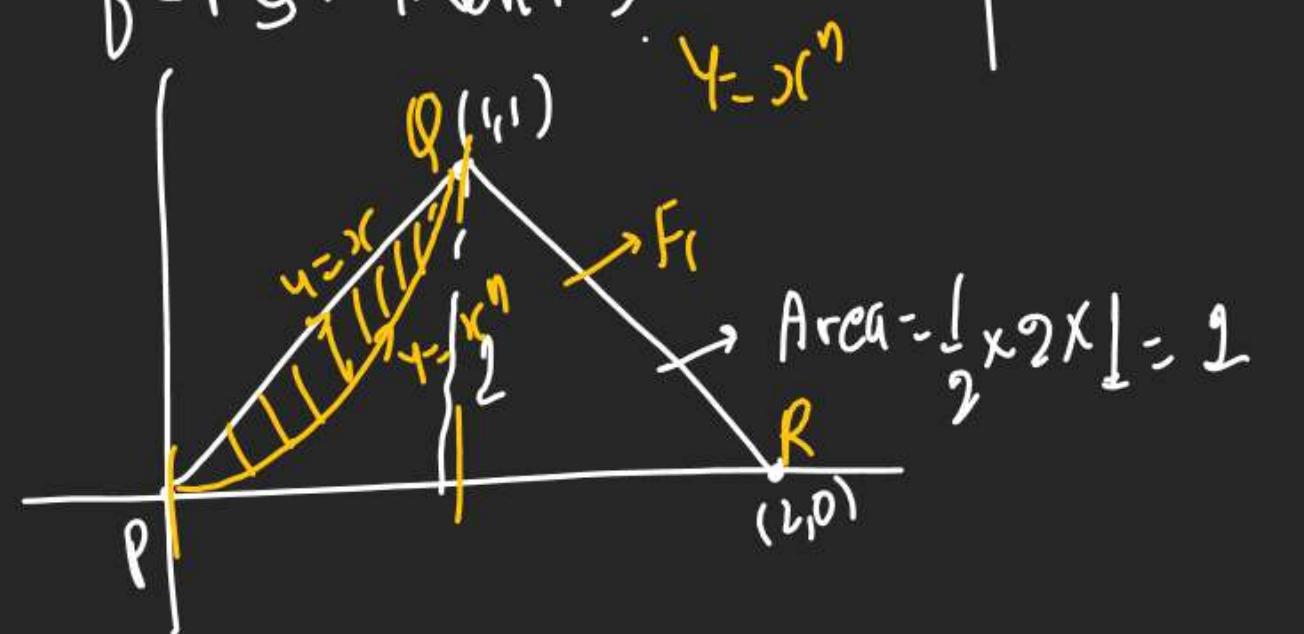
$$\text{Area} = \frac{1}{2} \times 2 \times 2 \times 4 = 8$$

Q A Farmer  $F_1$  has a land in shape of  $\triangle$ .

In it vertices  $P(0,0)$ ,  $Q(1,1)$ ,  $R(2,0)$

from this land a neighbouring farmer  $F_2$  takes away the region which lies between the sides  $PQ$  & a curve of the form  $x^n$  ( $n > 1$ ) the area of Region.

When away by the farmer is exactly 30% of area of  $\triangle PQR$  then  $n$ ?



$$\int_0^1 (x - x^n) dx = \frac{30}{100} \times 1$$

$$\left| \frac{x^2}{2} - \frac{x^{n+1}}{n+1} \right|_0^1 = \frac{3}{10}$$

$$\frac{1}{2} - \frac{1}{n+1} = \frac{3}{10}$$

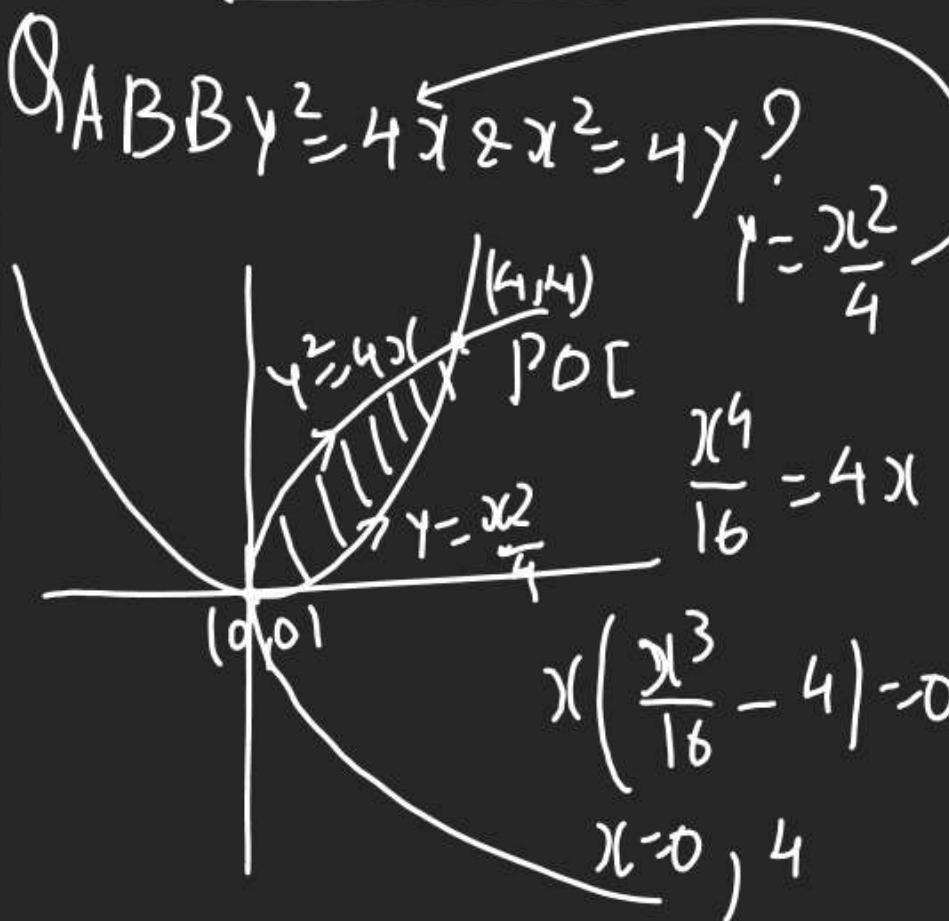
$$\frac{1}{2} - \frac{3}{10} = \frac{1}{n+1}$$

$$\frac{2}{10} = \frac{1}{n+1}$$

$$9n+2=10$$

$$\underline{n=4}$$

Trick Based Qs.



$$\begin{aligned} A &= \int_0^4 2\sqrt{x} - \frac{2x^2}{4} \cdot dx \\ &= 2 \cdot \frac{2}{3} x^{3/2} \Big|_0^4 - \frac{x^3}{12} \Big|_0^4 \\ &= \frac{4}{3}(8) - \left(\frac{64}{12}\right) = \frac{32}{3} - \frac{16}{3} = \frac{16}{3} \end{aligned}$$

Q A.B.B  $y^2 = 4Ax$  &  $x^2 = 4By$

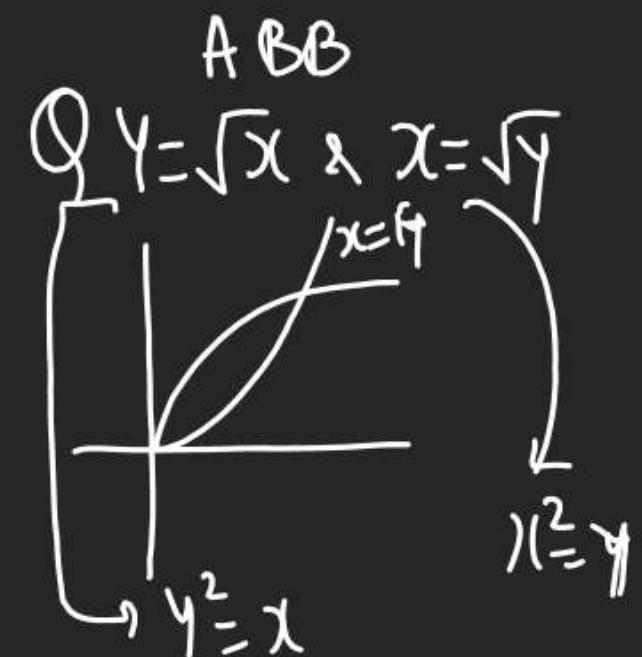
--- is  $\frac{16AB}{3}$

--- is  $\frac{(4A)(4B)}{3}$

--- is  $\frac{((\text{off of } x) \times (\text{off of } y))}{3}$

Pr. Q A.B.B  $\Rightarrow y^2 = 4x$  &  $x^2 = 4y$

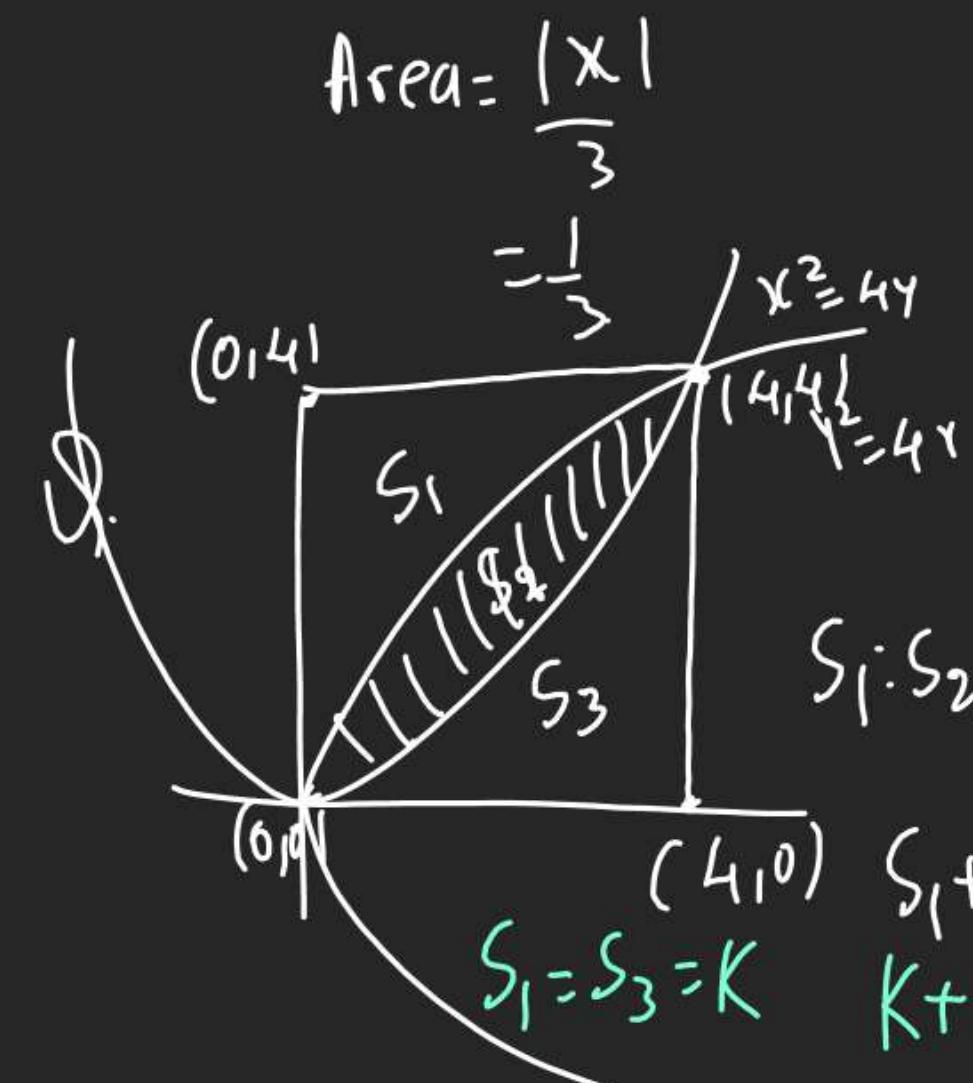
$\Rightarrow \text{Area} = \frac{4xy}{3} = \frac{16}{3}$ .



$S_1 = S_2 = S_3 = \frac{16}{3}$

$\therefore \text{Ratio} = 1 : 1 : 1$

(2) A.B.B  $y = \sin x, y = 6x, y = 0$  ?



$$\begin{aligned} A &= \int_{0}^{\pi} 6x - 6\sin x \, dx \\ &= [6x + 6\sin x] \Big|_0^\pi \\ &= (\pi^2 - 1) \end{aligned}$$

$S_1 + S_2 + S_3 = \text{Total Area}$

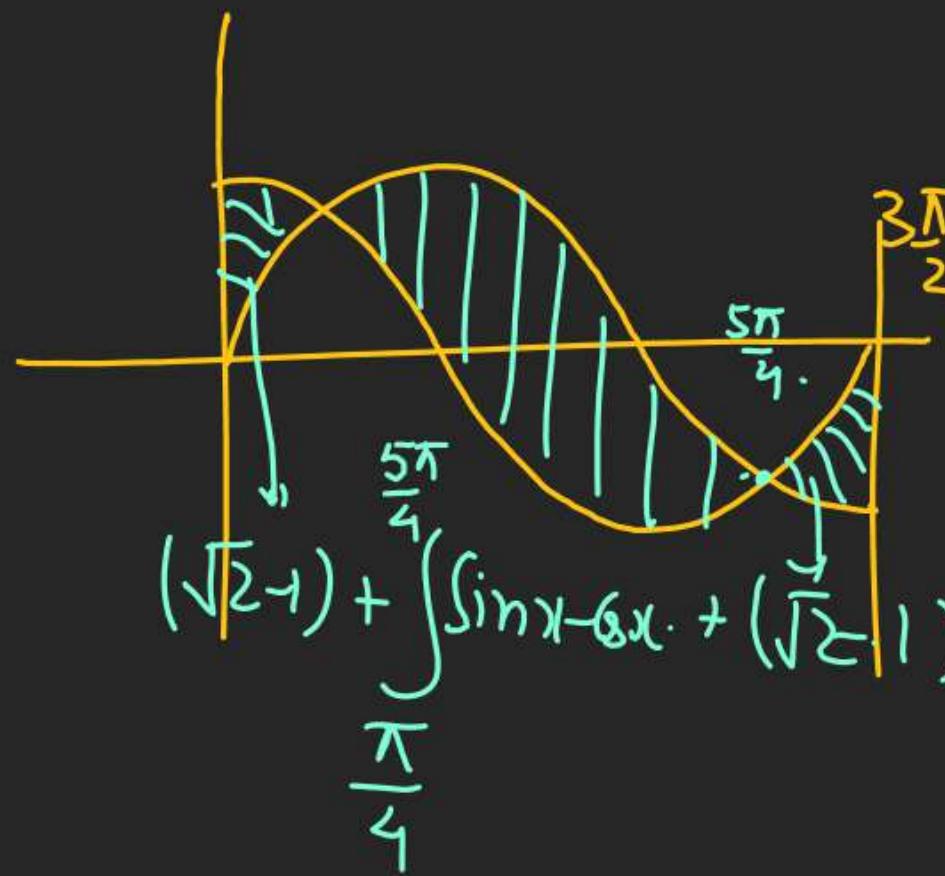
$S_1 = S_3 = K$

$K + \frac{16}{3} + K = 4\pi - 16$

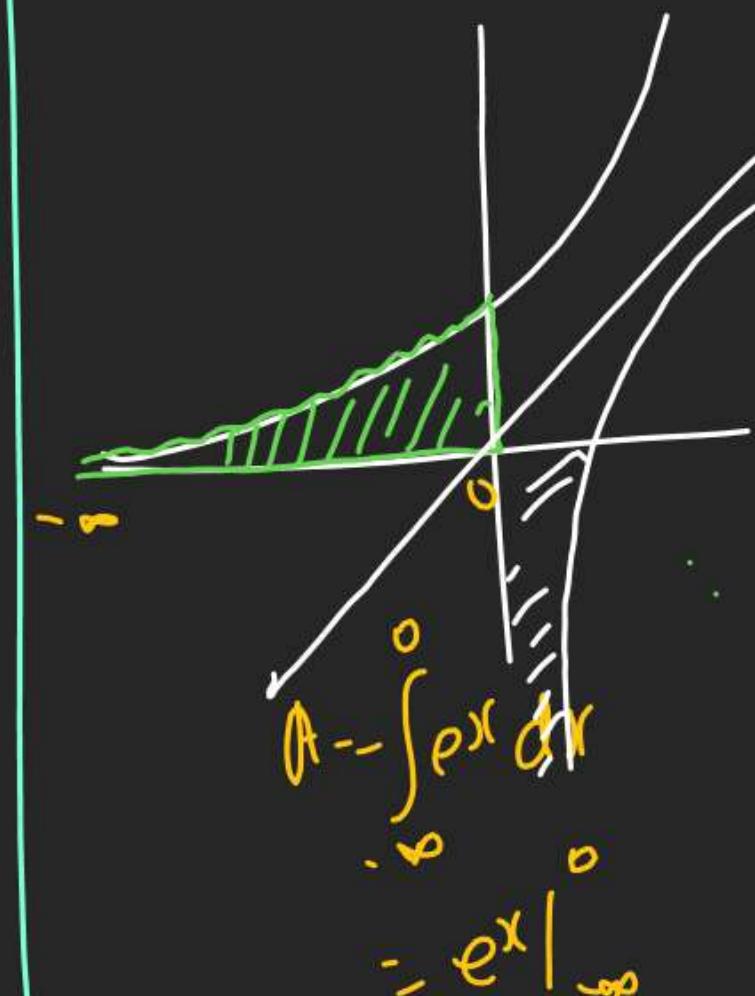
$2K = \frac{32}{3} \Rightarrow K = \frac{16}{3}$

Q ABB

$$y = \sin x, y = 6x, x=0 \text{ & } x = \frac{3\pi}{2}$$



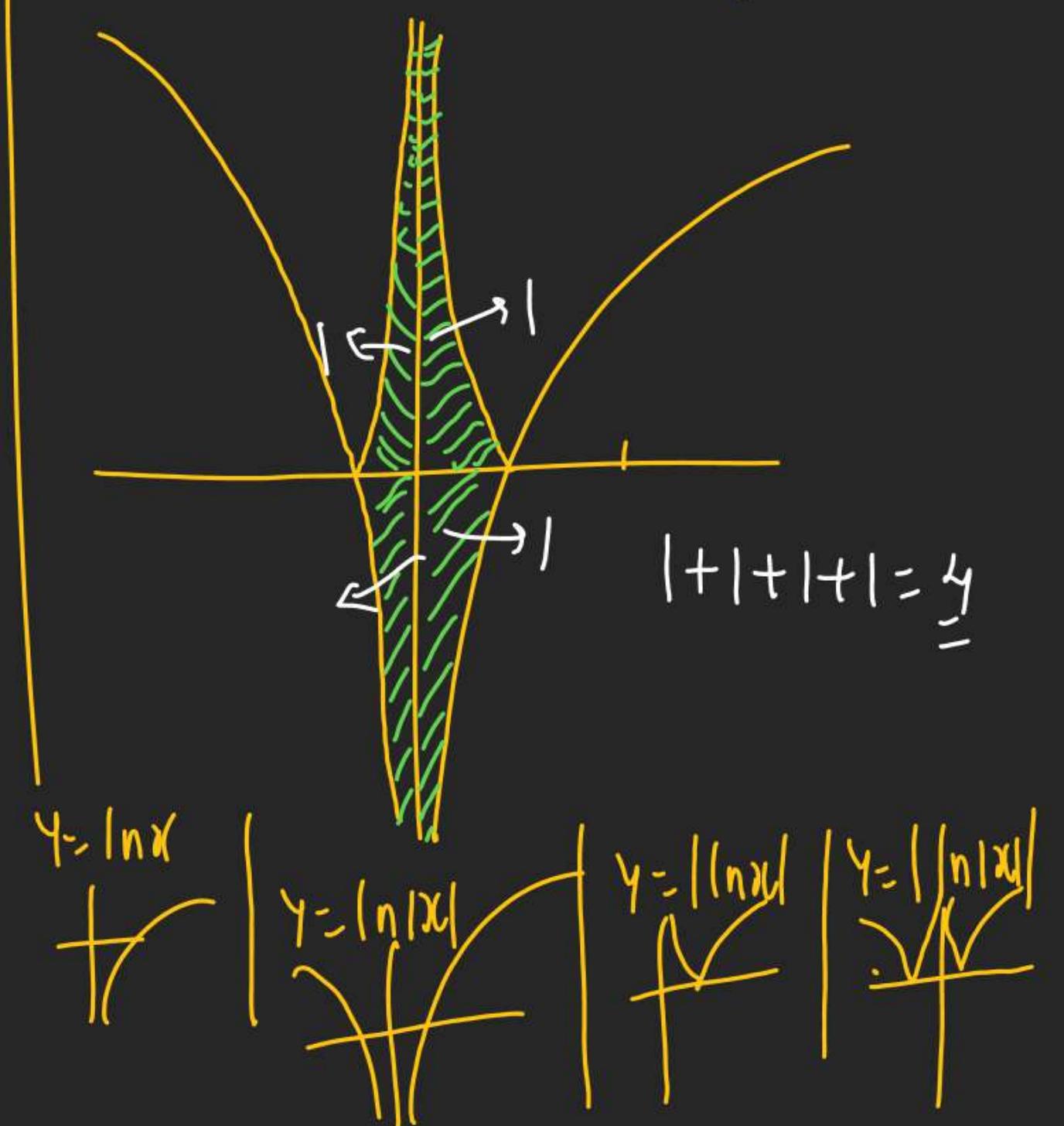
Q. ABB  $y = e^x$  & Convex?



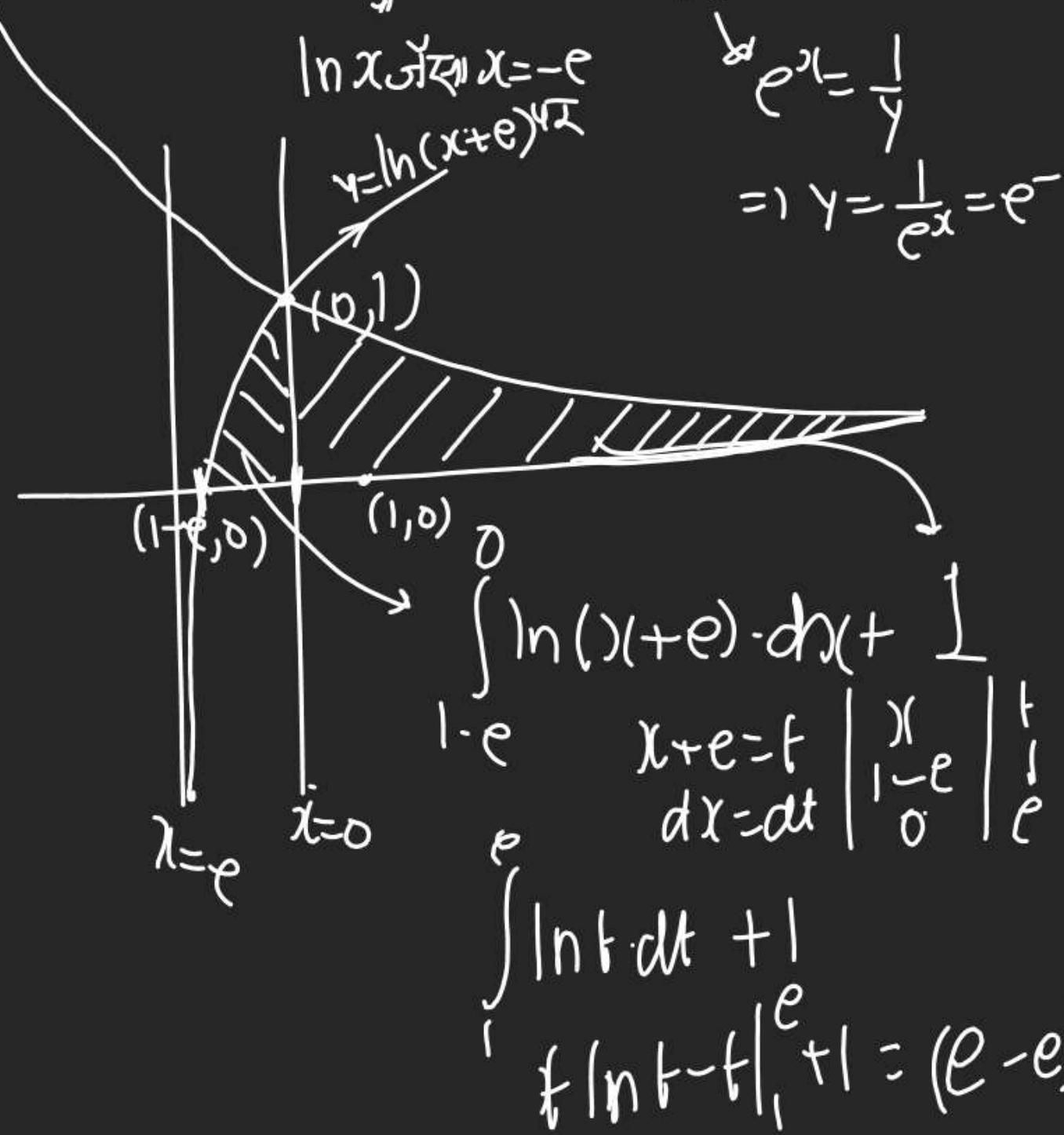
$$\begin{aligned} &= e^0 - e^{-\infty} \\ &= 1 - 0 \\ &= 1 \end{aligned}$$

Q ABB

$$y = \ln|x|, y = |\ln|x||, y = \ln|\ln|x||, y = ||\ln|\ln|x|||$$



Q) Find ABBB  $y = \ln(x+e)$ ,  $x = \log_e(\frac{1}{y})$  & x-axis



3) Area Bounded between

$$y^2 = 4ax \text{ & } y = mx \Rightarrow \frac{8a^2}{3m^3}$$

$$\text{B) ABBB } x^2 = 4by \text{ & } y = mx \Rightarrow \frac{8b^2 m^3}{3}$$

Q) ABBB  $y^2 = 4ax$  &  $y = mx$  in  $\frac{a^2}{3}$  from origin?

$$\frac{8a^2}{3m^3} = \frac{a^2}{3} \Rightarrow m = 2$$

(4) ABBB  $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$  in  $\pi ab$   
(Ellipse)

Q) ABBB  $x^2 + y^2 = 36$

$$\frac{x^2}{4} + \frac{y^2}{9} = 1$$

$$a=2, b=3$$

$$\text{Area: } \pi \times 2 \times 3 \\ = 6\pi$$

$$\text{Q) } ABBB \quad x = a \sin t, y = b \cos t.$$

$$\begin{array}{l} \downarrow \\ M_1 \quad \sin t = \frac{x}{a} \quad \cos t = \frac{y}{b}. \end{array}$$

$$\sin^2 t + \cos^2 t = 1$$

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1 \rightarrow \frac{y^2}{b^2} = 1 - \frac{x^2}{a^2} = \frac{a^2 - x^2}{a^2}$$

$$\text{Area} = \pi ab.$$



$$A = 4 \int_0^a y \, dx$$

$$\text{M2: } -4b \int_0^a \sqrt{a^2 - x^2} \, dx = 4b \left[ \frac{x}{2} \sqrt{a^2 - x^2} + \frac{a^2}{2} \sin^{-1} \frac{x}{a} \right]_0^a$$

$$\begin{aligned} & \text{Q) } AABB \quad E: 9x^2 + 4y^2 - 36x + 8y + 4 = 0 \\ & L: 3x + 2y - 10 = 0 \quad \xrightarrow{\text{L: } 3(x-2) + 2(y+1) = 6} \\ & E: (9x^2 - 36x) + (4y^2 + 8y) + 4 = 0 \\ & 9(x^2 - 4x + 4) + 4(y^2 + 2y + 1) = 36 \\ & 9(x-2)^2 + 4(y+1)^2 = 36 \\ & E: \frac{(x-2)^2}{4} + \frac{(y+1)^2}{9} = 1 \quad \xrightarrow{\frac{x^2}{4} + \frac{y^2}{9} = 1} \\ & x = a \sin t, y = b \cos t \\ & y = \frac{b}{a} \sqrt{a^2 - x^2} \end{aligned}$$

$$\begin{aligned} A &= 4 \int_0^a b \cos t \cdot a \sin t dt \\ &= 4ab \int_0^a \frac{1}{2} + \frac{\cos 2t}{2} \cdot dt \end{aligned}$$

$$\begin{array}{|c|c|} \hline x & t \\ \hline 0 & 0 \\ a & \frac{\pi}{2} \\ \hline \end{array}$$

$$\pi ab$$

$$\text{Area} \left( \frac{3\pi}{2} - 3 \right)$$

$$\begin{aligned} & L: 3x + 2y = 6 \\ & \frac{x}{2} + \frac{y}{3} = 1 \end{aligned}$$

$$\frac{x}{2} + \frac{y}{3} = 1$$

$$(0,3)$$

$$2$$

$$(2,0)$$

$$3$$

$$2$$

$$1$$

$$2$$

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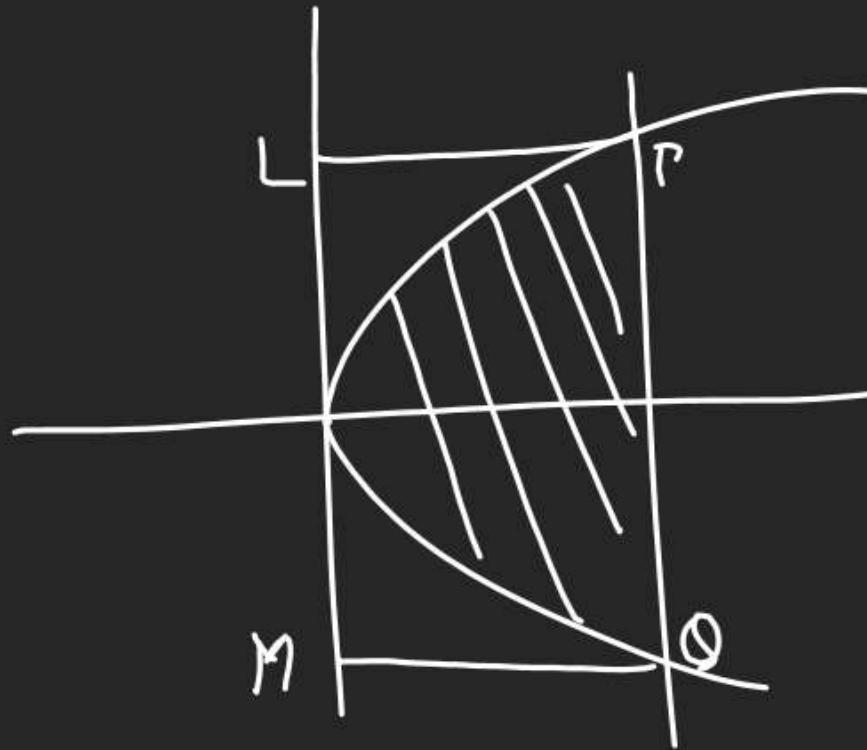
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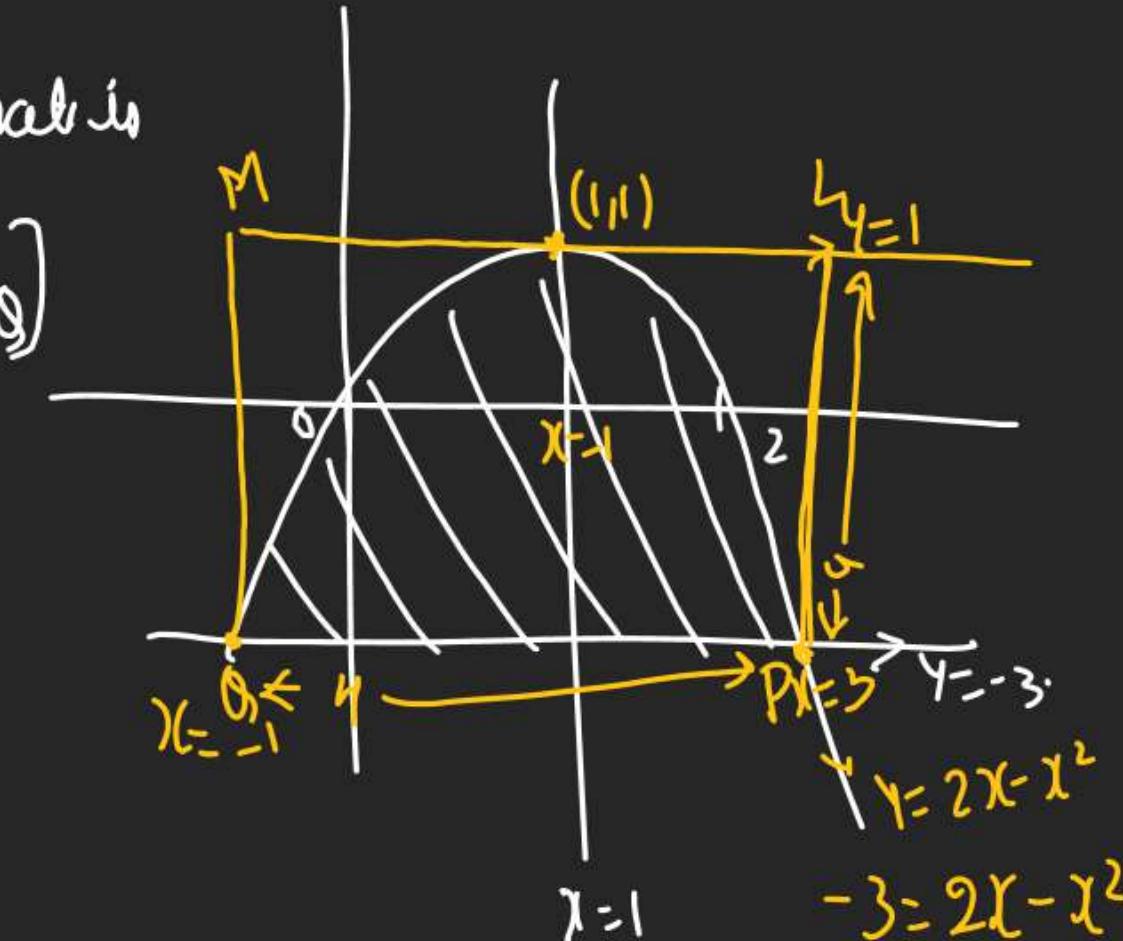
$$2$$

(5) ABBB  $y^2 = 4ax$  & its Double ordinates

$$A = \frac{2}{3} [\text{Area of Rectangle PLMQ}]$$



$$\begin{aligned} Q \quad & \text{ABB} \quad y^2 = 4x \quad & y^2 + 4x = 0 \\ & \therefore (y)(y+4x) = 0 \end{aligned}$$



$$\begin{aligned} & \text{Shaded Area} \\ & = \frac{2}{3} [4 \times 4] \\ & = \frac{32}{3} \end{aligned}$$

$$x = 3, -1$$

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

$$(x-3)(x+1) = 0$$