

Q A Poly fn satisfies Condⁿ

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

If $f(0) = 1$. Find also the eqⁿ of Pair of tangents from origin

& Compute area enclosed by Curve & Pair of tangents.

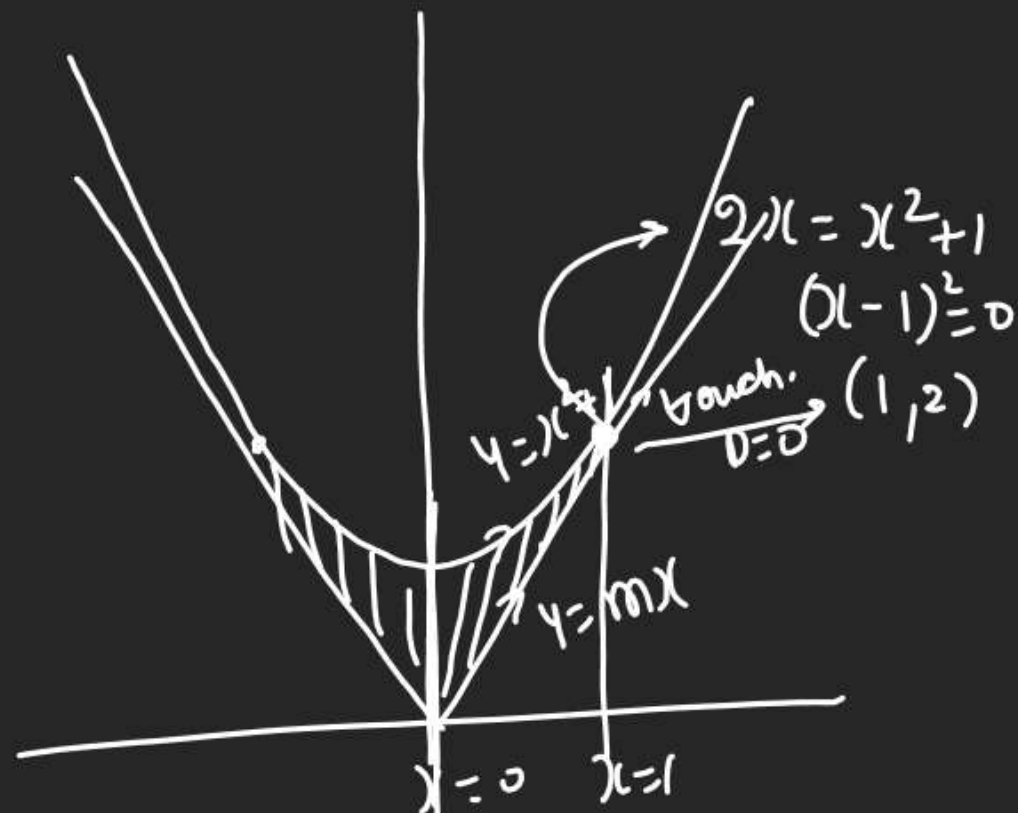
$$f(x+1) = f(x) + 2x + 1$$

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

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

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

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



$$mx = x^2 + 1$$

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

$$D = 0$$

$$m^2 - 4 = 0$$

$$m = \pm 2$$

$$\therefore y = 2x$$

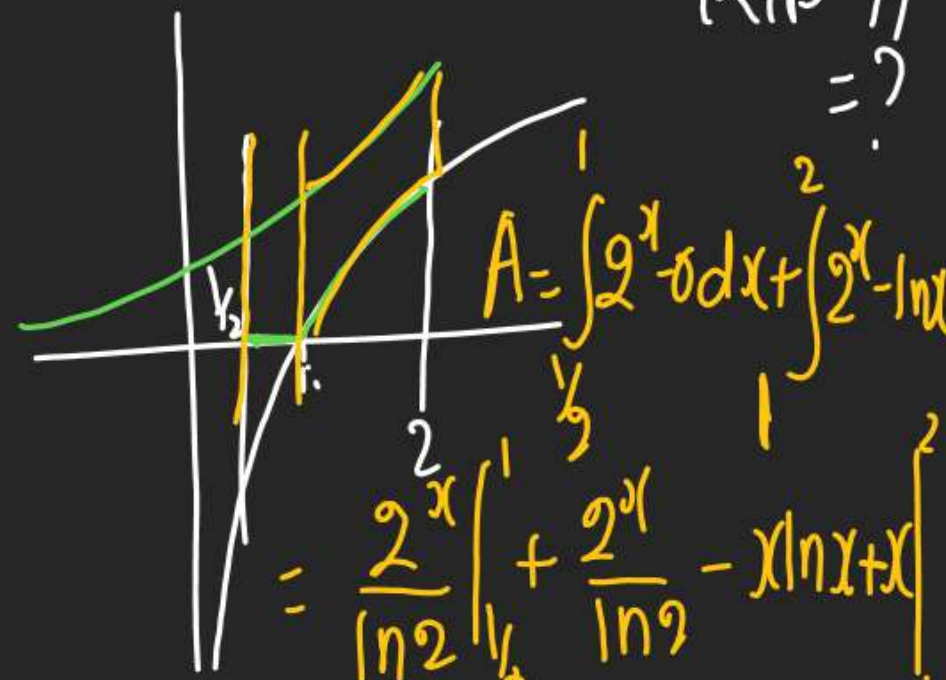
$$\therefore \text{Area} = 2 \int_0^1 (x^2 + 1 - 2x) dx = 2 \int_0^1 (x-1)^2 dx = 2 \left[\frac{(x-1)^3}{3} \right]_0^1 = 0 - \left(-\frac{2}{3} \right) = \frac{2}{3}$$

Q Area of Region Bounded

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

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

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



$$A = \int_{1/2}^1 2^x dx + \int_1^2 (2^x - \ln x) dx$$

$$= \left[\frac{2^x}{\ln 2} \right]_{1/2}^1 + \left[\frac{2^x}{\ln 2} - x \ln x + x \right]_1^2$$

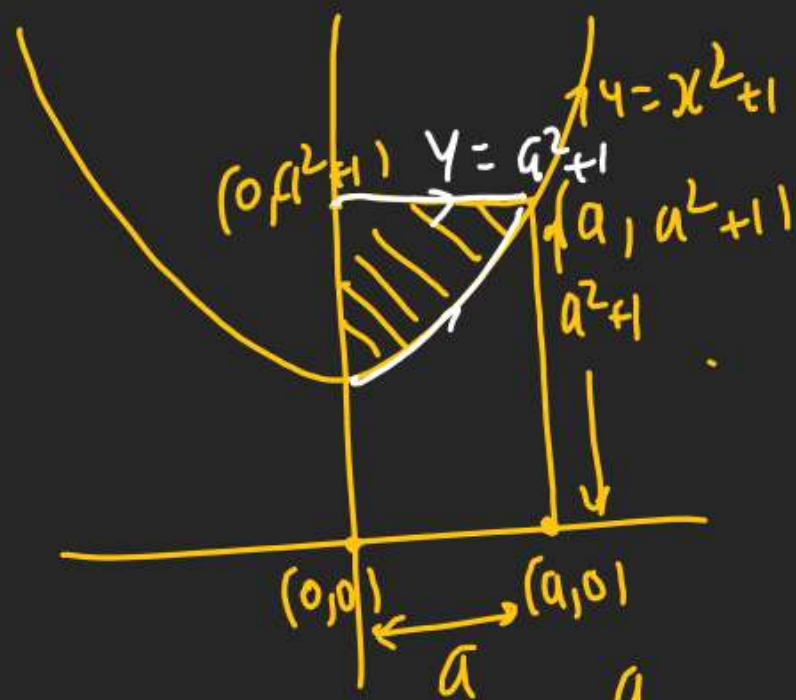
Solve & get α, β, γ

$$= \frac{2}{3}$$

Q +ve value of a for which Parabola.

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

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



$$\text{Area} = a(a^2+1) = 2 \int_0^a (a^2+1) - (x^2+1) dx$$

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

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

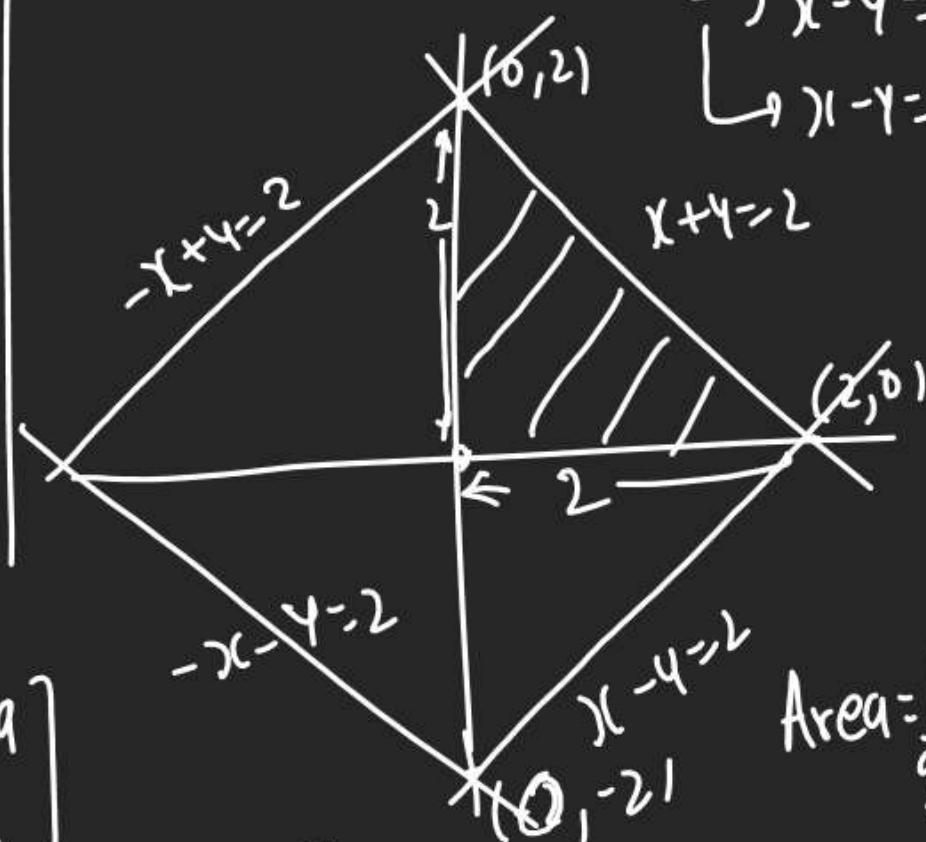
Q Region Rep. by

$$|x-y| \leq 2 \text{ \& \& } |x+y| \leq 2$$

$$\downarrow \quad \downarrow$$

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

4 lines here. $\begin{cases} \rightarrow x+y=2 \\ \rightarrow x+y=-2 \\ \rightarrow x-y=2 \\ \rightarrow x-y=-2 \end{cases}$



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

Q A farmer F_1 has a land in shape of Δ .

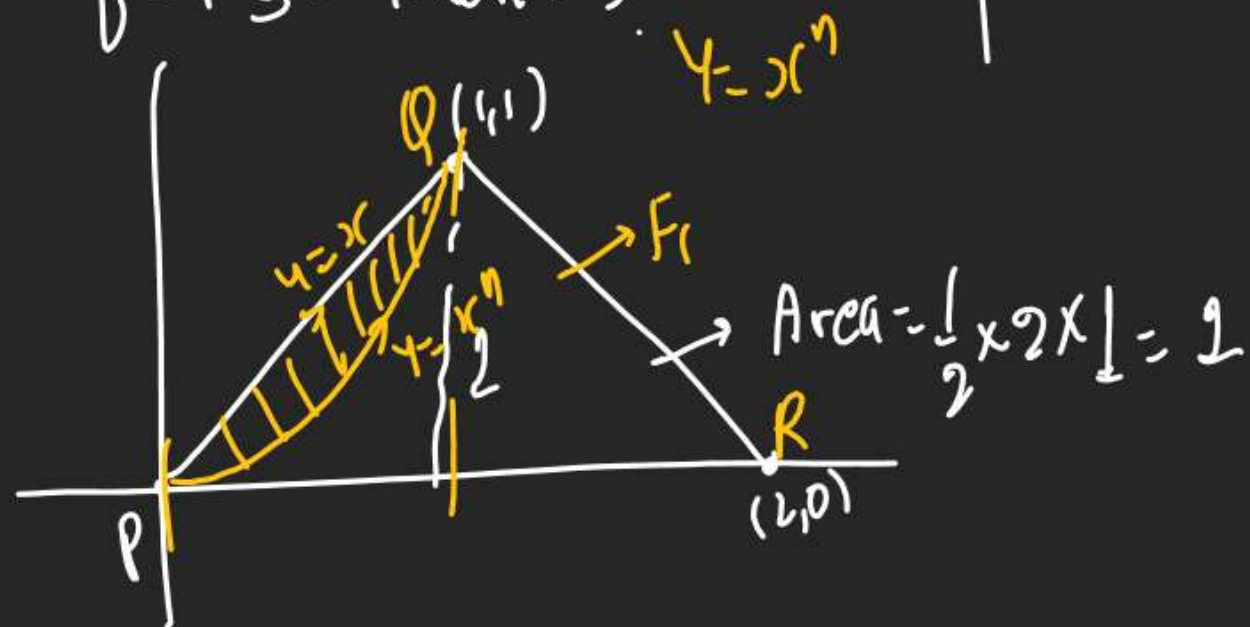
With vertices $P(0,0)$ $Q(1,1)$ $R(2,0)$

From this land a neighbouring farmer

F_2 takes away the region which

lies betⁿ the side PQ & a curve of the form x^n ($n > 1$) the area of region

taken away by the farmer is exactly 30% of area of ΔPQR then n ?



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

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

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

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

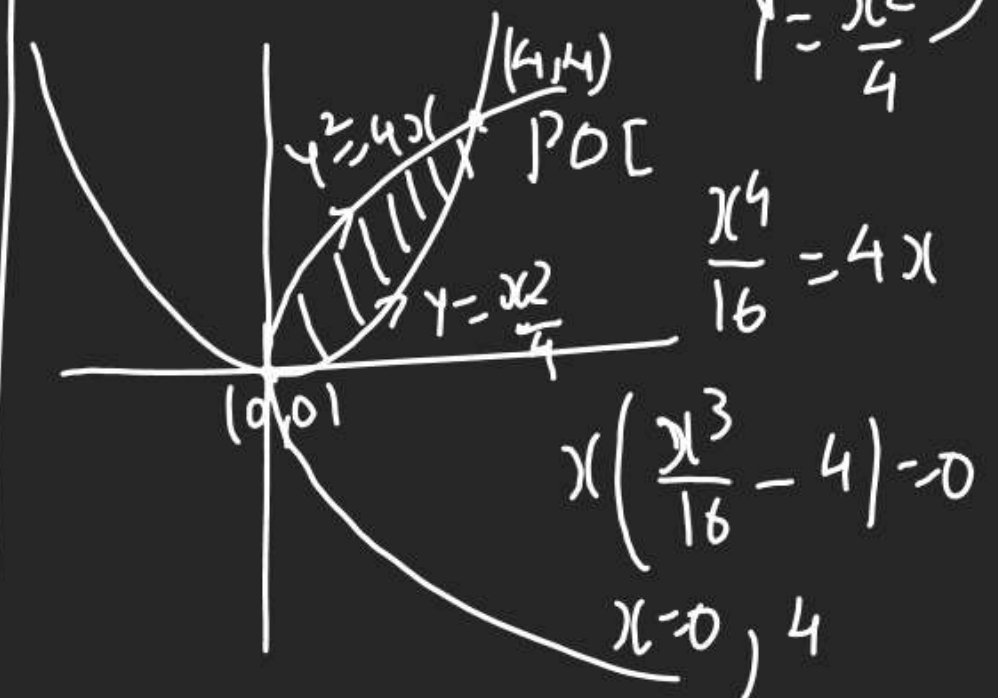
$$\frac{2}{10} = \frac{1}{n+1}$$

$$2n+2=10$$

$$\underline{n=4}$$

Trick Based Qs.

Q $ABBY^2 = 4x$ & $x^2 = 4y$?



$$A = \int_0^4 \left(2\sqrt{x} - \frac{x^2}{4} \right) \cdot dx$$

$$= 2 \cdot \frac{2}{3} \left. x^{3/2} \right|_0^4 - \frac{x^3}{12} \Big|_0^4$$

$$= \frac{4}{3} (8) - \left(\frac{64}{12} \right) = \frac{32}{3} - \frac{16}{3} = \frac{16}{3}$$

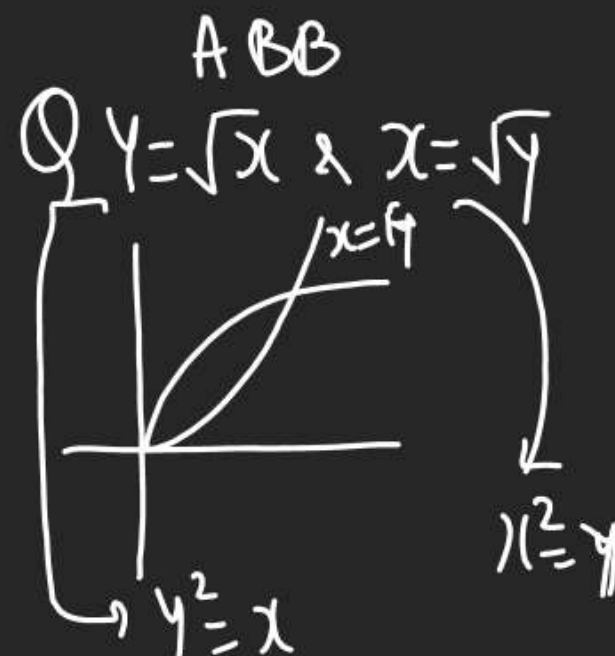
① A.B.B $y^2 = 4Ax$ & $x^2 = 4By$

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

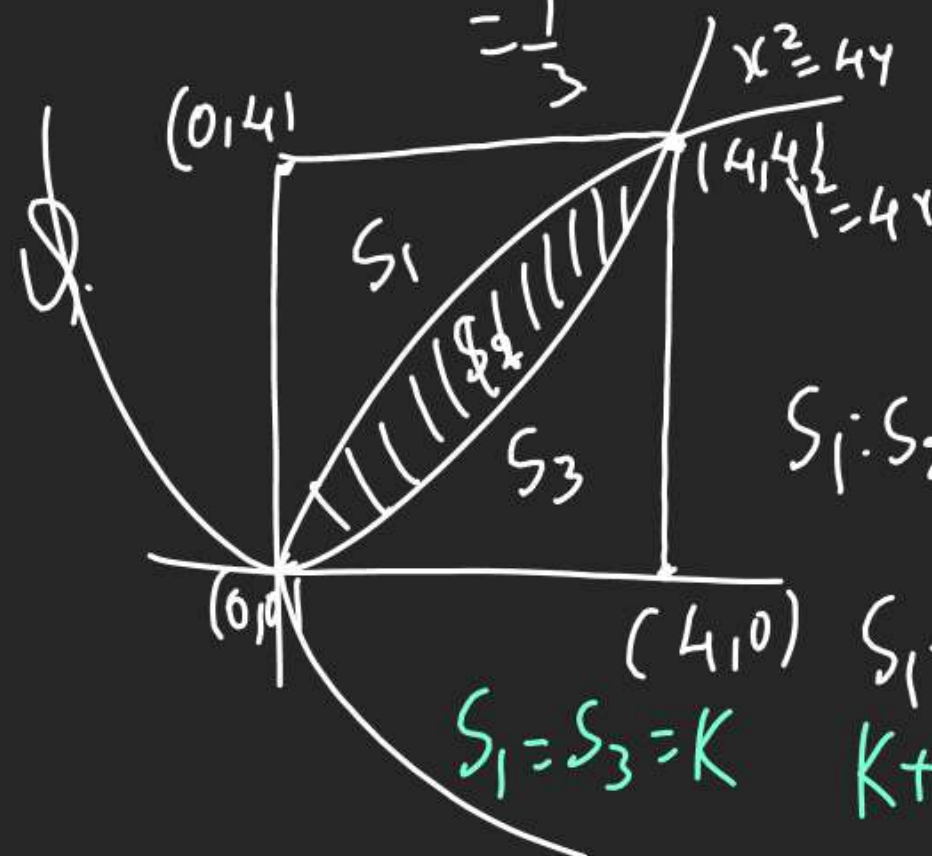
--- is $\frac{(4A)(4B)}{3}$

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

Pr. Q ABB $\Rightarrow y^2 = 4x$ & $x^2 = 4y$
 $\Rightarrow \text{Area} = \frac{4 \times 4}{3} = \frac{16}{3}$



Area = $\frac{|x|}{3}$
 $= \frac{1}{3}$



$S_1 : S_2 : S_3 = ?$

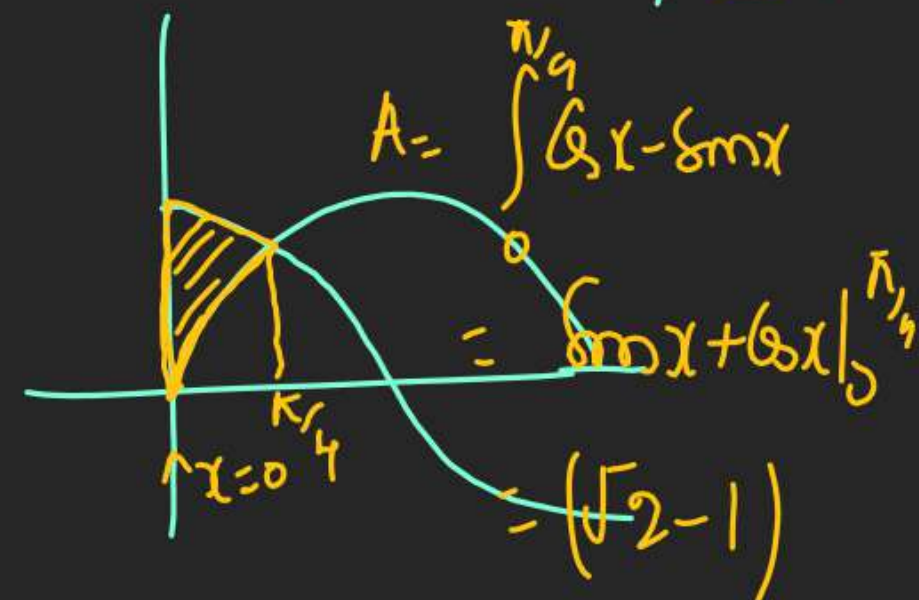
$S_1 = S_3 = K$

$S_1 + S_2 + S_3 = \text{Total Area}$
 $K + \frac{16}{3} + K = 4 \times 4 = 16$
 $2K = 3\frac{2}{3} \Rightarrow K = \frac{16}{3}$

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

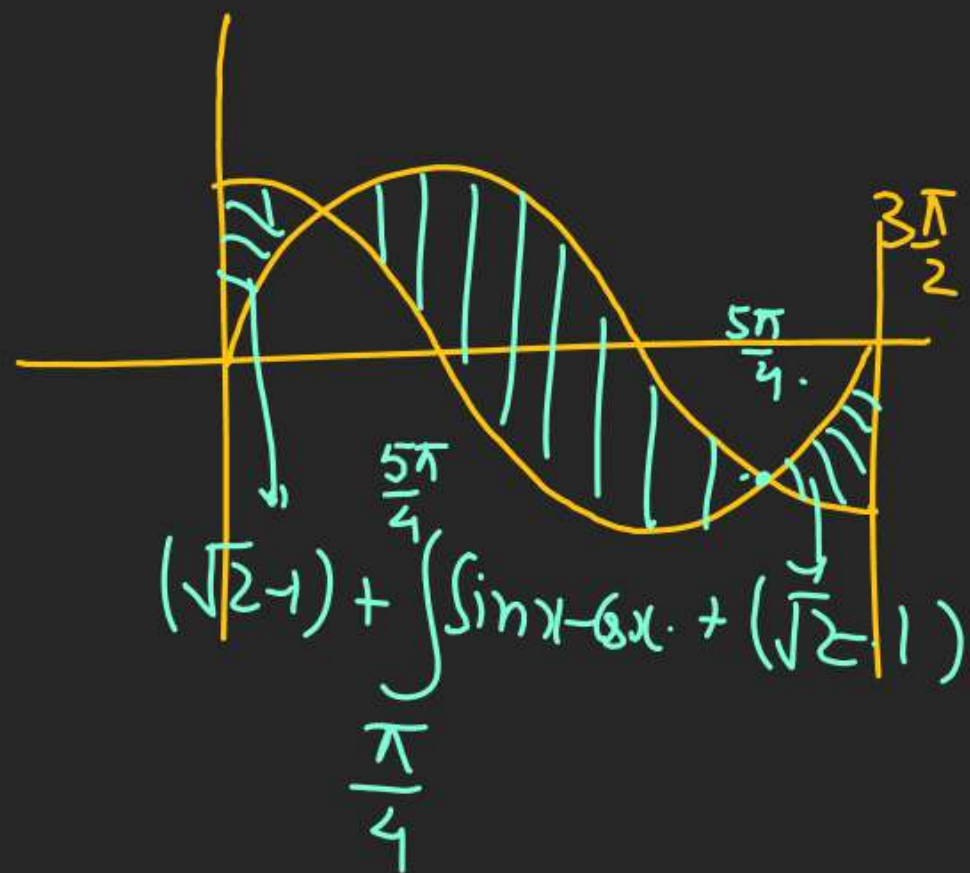
$\therefore \text{Ratio} = 1 : 1 : 1$

(2) ABB $y = \sin x$, $y = \cos x$, $x = 0$?

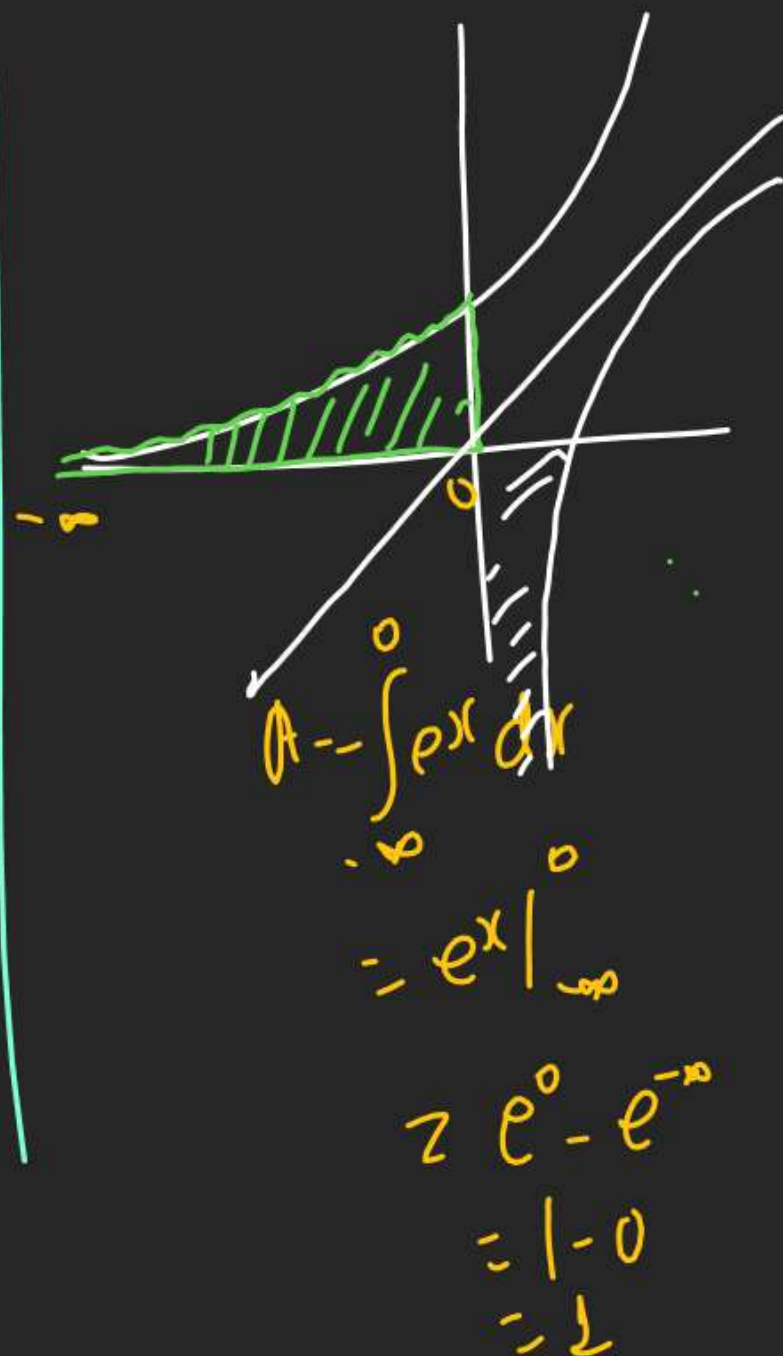


Q ABB

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

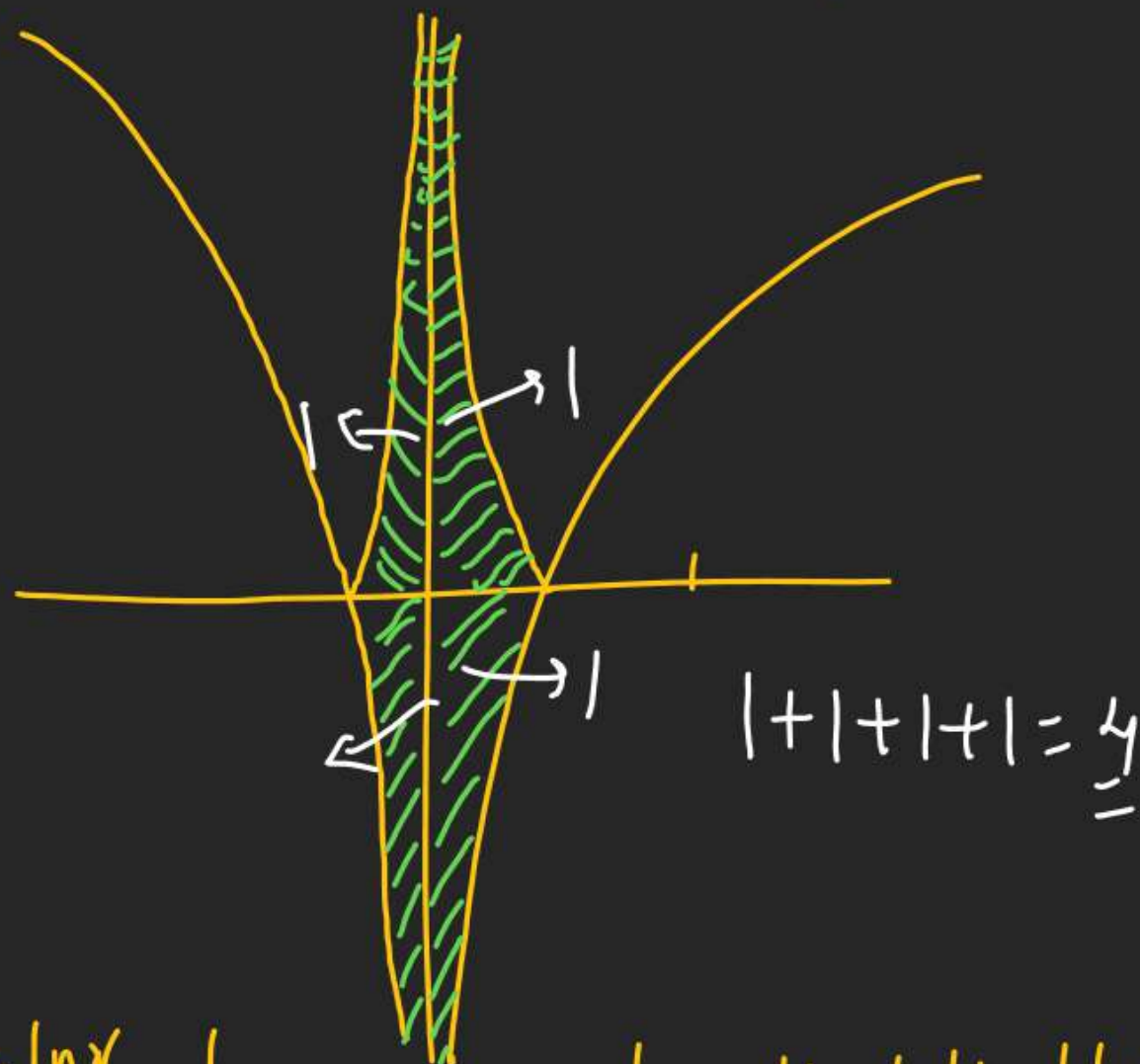


Q. ABB $y = e^x$ & conves?



Q ABB

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



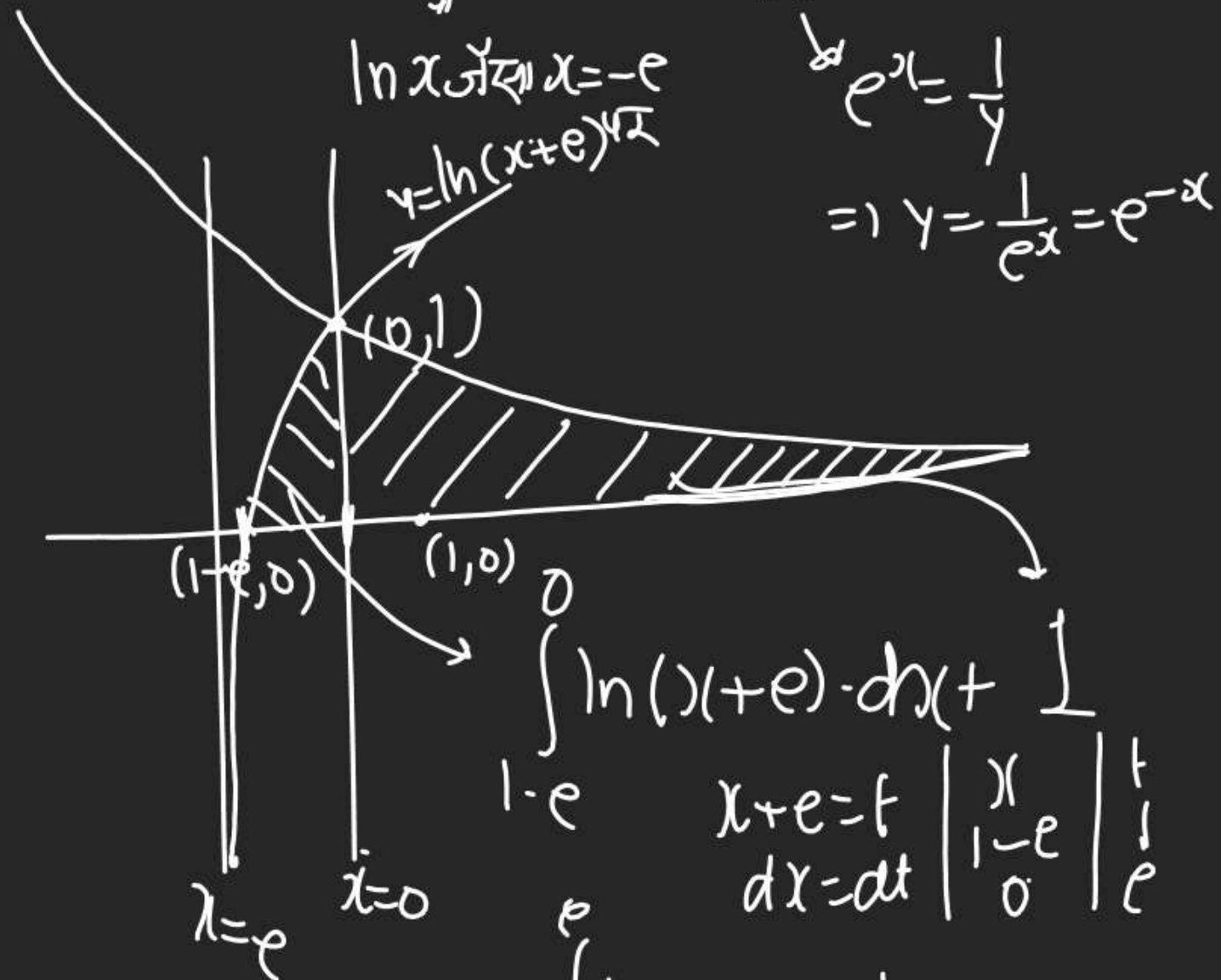
$$y = \ln x$$

$$y = |\ln x|$$

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

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

Q Find Area Bounded by $y = \ln(x+e)$, $x = \ln e \left(\frac{1}{y} \right)$ & x-axis



$$\int_{1-e}^0 \ln(x+e) \cdot dx + \int_0^1 \ln(x+e) \cdot dx$$

$$x+e = t \quad \left| \begin{array}{l} x \\ 1-e \\ 0 \end{array} \right| \quad \left| \begin{array}{l} t \\ 1 \\ e \end{array} \right|$$

$$dx = dt$$

$$\int_1^e \ln t \cdot dt + 1$$

$$\left[t \ln t - t \right]_1^e + 1 = (e - e) - (0 - 1) + 1 = 2$$

3) Area Bounded by $y^2 = 4ax$ & $y = mx$ in $\frac{\pi a^2}{3m^3}$

B) Area Bounded by $x^2 = 4by$ & $y = mx$ in $\frac{\pi b^2 m^3}{3}$

Q Area Bounded by $y^2 = 4ax$ & $y = mx$ in $\frac{\pi a^2}{3}$ find m ?

$$\frac{\partial}{\partial m} \left(\frac{\pi a^2}{3} \right) = \frac{\pi a^2}{3} \Rightarrow m = 2$$

(4) Area Bounded by $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ in πab (Ellipse)

Q Area Bounded by $9x^2 + 4y^2 = 36$

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

$$a = 2, b = 3$$

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

Q ABB $x = a \sin t, y = b \cos t$

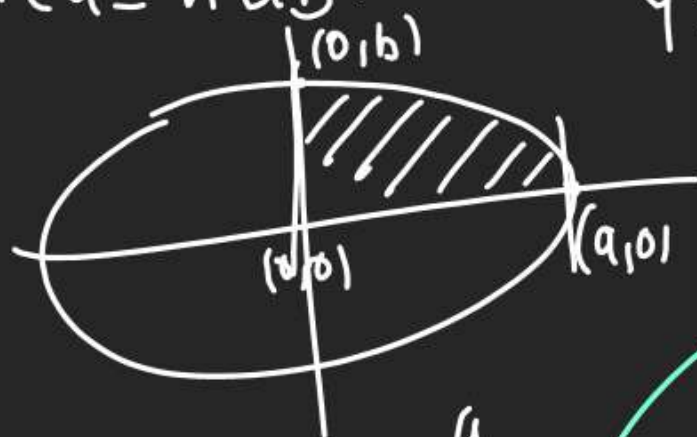
M1 $\sin t = \frac{x}{a} \quad \cos t = \frac{y}{b}$

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

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

Area = πab

M2



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

M4 $= 4b \int_0^a \sqrt{a^2 - x^2} \, dx = \frac{4b}{a} \left[\frac{x}{2} \sqrt{a^2 - x^2} + \frac{a^2}{2} \sin^{-1} \frac{x}{a} \right]_0^a$

Q ABB. E: $9x^2 + 4y^2 - 36x + 8y + 4 = 0$

L: $3x + 2y - 10 = 0$

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: $\frac{(x-2)^2}{4} + \frac{(y+1)^2}{9} = 1 \rightarrow \frac{x^2}{4} + \frac{y^2}{9} = 1$

$x = a \sin t, y = b \cos t$

M3

Adv

$A = 4 \int_0^{\pi/2} b \cos t \cdot a \sin t \, dt$

$= 4ab \int_0^{\pi/2} \frac{1}{2} + \frac{\cos 2t}{2} \, dt$

x	t
0	0
a	$\frac{\pi}{2}$

Shaded Area = $\pi \frac{ab}{4} - \Delta$

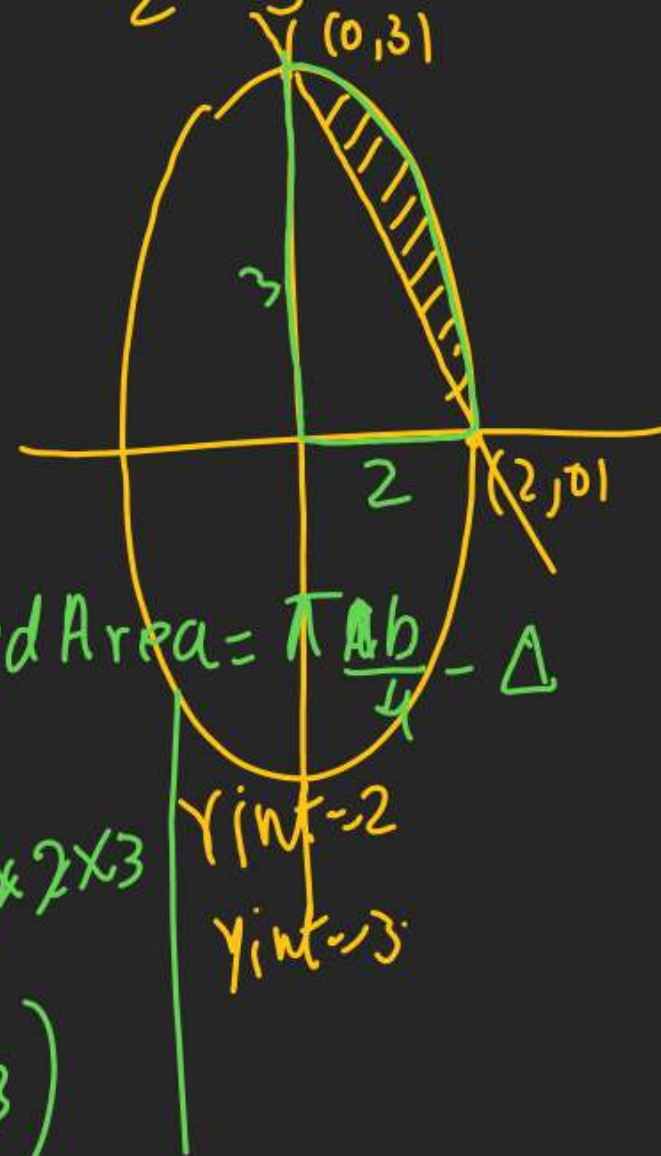
$\frac{\pi \times 2 \times 3}{4} - \frac{1}{2} \times 2 \times 3$

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

L: $3(x-2) + 2(y+1) = 6$

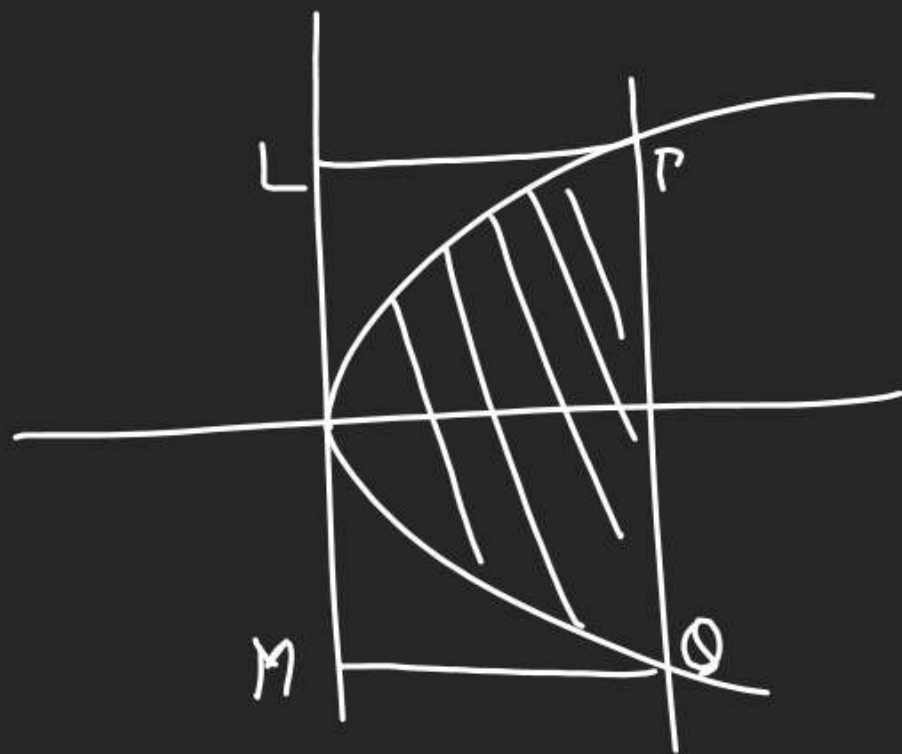
$3x + 2y = 6$

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

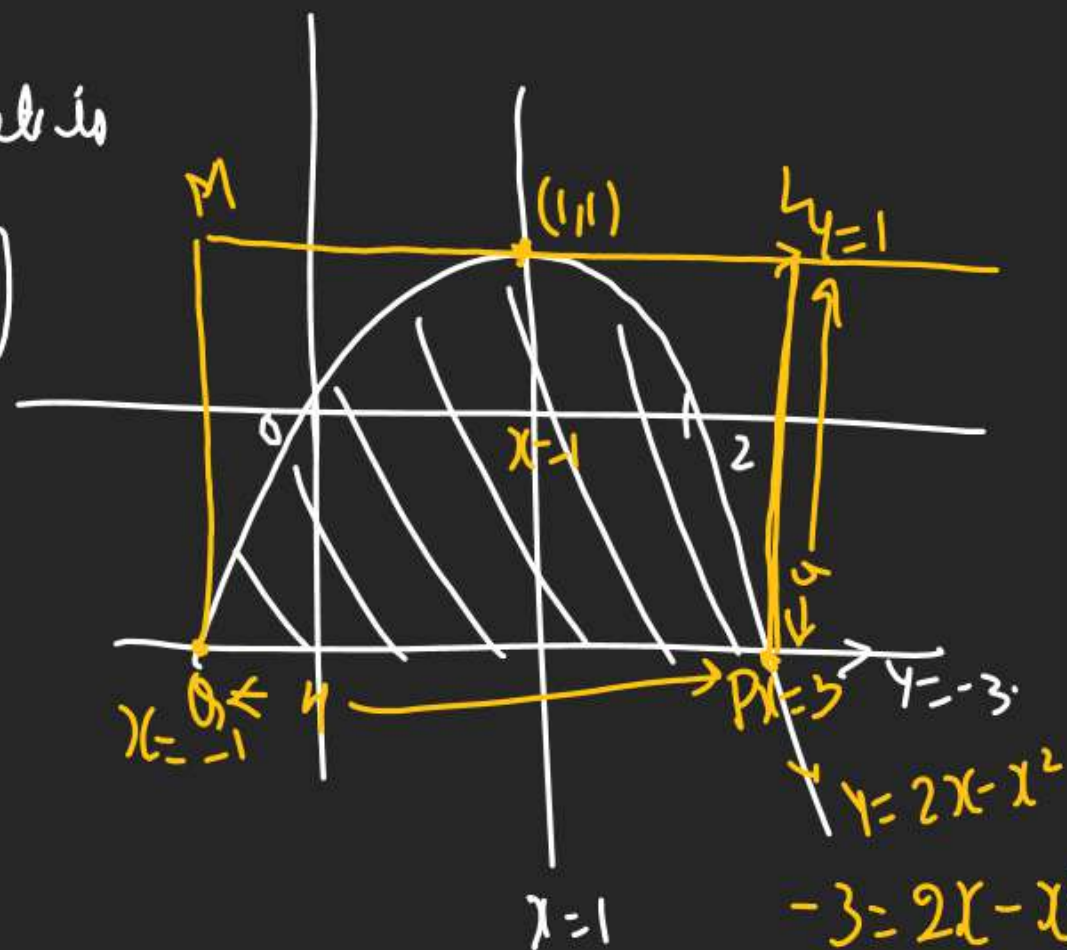
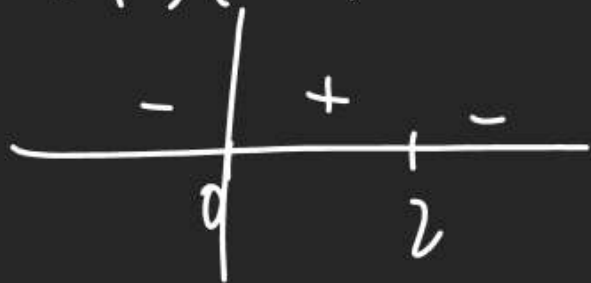


(5) ABB $y^2 = 4ax$ its Double ordinate is

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



Q ABB $y = 2x - x^2$ & $4+3=0$
 $= x(x-2) \rightarrow y = -3$



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

$$\begin{aligned} -3 &= 2x - x^2 \\ x^2 - 2x - 3 &= 0 \\ (x-3)(x+1) &= 0 \\ x &= 3, -1 \end{aligned}$$