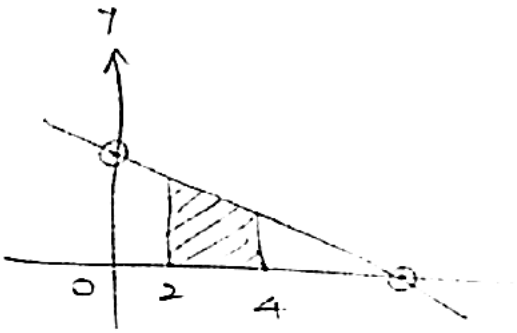
Exercise 3.1

1)



$2y + x = 8$

x	0	8
y	4	0

$(0,4)(8,0)$

put $x = 0$: $2y + x = 8$, $2y + 0 = 8$, $2y = 8$, $y = 8/2$, $y = 4$

put $y = 0$: $2(0) + x = 8$, $x = 8$

$$\text{Area} = \int_2^4 y\,dx$$

$$\left[\because 2y + x = 8 \quad 2y = 8 - x \quad y = \frac{8-x}{2}\right]$$

$$= \int_2^4 \frac{8-x}{2}\,dx$$

$$= \frac{1}{2}\left[8x - \frac{x^2}{2}\right]_2^4$$

$$= \frac{1}{2}\left[\left(8(4) - \frac{4^2}{2}\right) - \left(8(2) - \frac{2^2}{2}\right)\right]$$

$$= \frac{1}{2}\left[\left(32 - \frac{16}{2}\right) - \left(16 - \frac{4}{2}\right)\right]$$

$$= \frac{1}{2}\left[(32 - 8) - (16 - 2)\right]$$

$$= \frac{1}{2}\left[24 - 14\right]$$

$$= \frac{1}{2}[10]$$

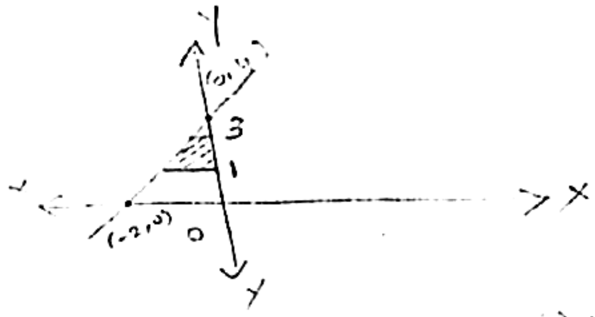
$$= 10/2$$

$$= 5 \text{ Sq. units.}$$

) $y - 2x - 4 = 0$

x	0	-2
y	4	0

(0, 4) (-2, 0)



$0 - 2x - 4 = 0$

$-2x = 4$

$x = \frac{4^2}{2_1}$

$x = -2$

$$\text{Area} = -\int x\,dy$$

$$= -\int \frac{y-4}{2}\,dy$$

$\because y - 2x - 4 = 0$

$y - 4 = 2x$

$\frac{y-4}{2} = x$

$\boxed{x = \frac{y-4}{2}}$

$$= -\frac{1}{2}\left[\frac{y^2}{2} - 4y\right]_1^3$$

$$= -\frac{1}{2}\left[\left(\frac{3^2}{2} - 4(3)\right) - \left(\frac{1^2}{2} - 4(1)\right)\right]$$

$$= -\frac{1}{2}\left[\left(\frac{9}{2} - 12\right) - \left(\frac{1}{2} - 4\right)\right]$$

$$= -\frac{1}{2}\left[\frac{9-24}{2}\right] - \left[\frac{1-8}{2}\right]$$

$$= -\frac{1}{2}\left[\frac{-15}{2}\right] + \frac{7}{2}$$

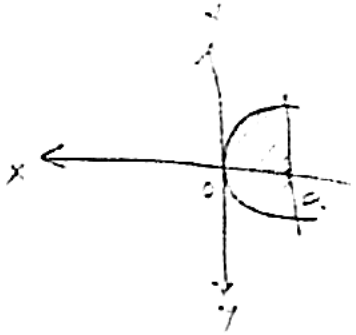
$$= -\frac{1}{2}\left[-\frac{15}{2} + \frac{7}{2}\right]$$

$$= -\frac{1}{2}\left[-\frac{8}{2}\right]$$

$$= \frac{8}{4}$$

Area = 2 sq. units

3) $y^2 = 4ax$



$$\text{Area} = 2\int_0^a y\,dx$$

$$\left[\because y = \sqrt{4ax}\right.$$

$$\left. y = 2\sqrt{a}\sqrt{x}\right]$$

$$= 2\int_0^a 2\sqrt{a}\cdot\sqrt{x}\,dx$$

$$= 2\cdot 2\int_0^a \sqrt{a}\sqrt{x}\,dx$$

$$= 4\sqrt{a}\int_0^a \sqrt{x}\,dx$$

$$= 4\sqrt{a}\left[\frac{x^{3/2}}{3/2}\right]_0^a$$

$$= 4\sqrt{a}\left[\frac{a^{3/2}}{3/2} - 0\right]$$

$$= 4\sqrt{a}\times\frac{2}{3}\left[a^{3/2}\right]$$

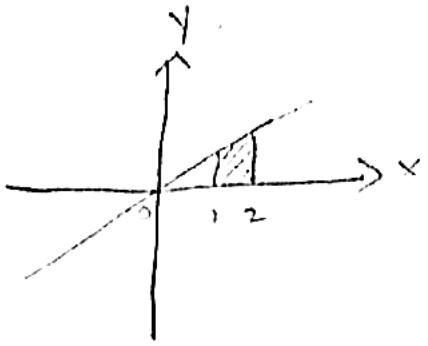
$$= \frac{8\sqrt{a}}{3}\,a^{3/2}$$

$$= \frac{8a^{1/2}\,a^{3/2}}{3}.$$

$$\text{Area} = \frac{8a^2}{3}\text{ Sq. Units}$$

4)

Sol: $y = x$



$$\text{Area} = \int_1^2 y\,dx$$

$$= \int_1^2 x\,dx$$

$$= \left[\frac{x^2}{2}\right]_1^2$$

$$= \left[\frac{2^2}{2} - \frac{1^2}{2}\right]$$

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

$$= \frac{8-2}{4}$$

$$= \frac{6}{4}$$

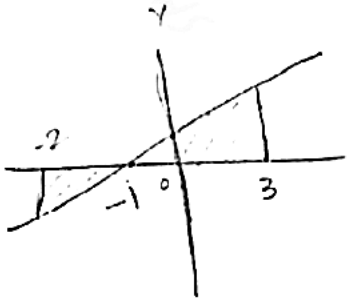
$$\text{Area} = \frac{3}{2} \text{ sq. units}$$

5)

$y - 1 = x$

x	0	−1
y	1	0

(0, 1) (−1, 0).



$y - 1 = x$

$x = -1$

$y - 1 = x$

$y = 1$

$$= -\int_{-2}^{-1} y\,dx + \int_{-1}^{3} y\,dx$$

$$= -\int_{-2}^{-1} (x+1)\,dx + \int_{-1}^{3} (x+1)\,dx$$

$$= -\left[\frac{x^2}{2} + x\right]_{-2}^{-1} + \left[\frac{x^2}{2} + x\right]_{-1}^{3}$$

$\because y - 1 = x$

$y = x + 1$

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

$$-\left[\left(\frac{1}{2}-1\right)-\left(\frac{4}{2}-2\right)\right]+\left[\left(\frac{9}{2}+3\right)-\left(\frac{1}{2}-1\right)\right]$$

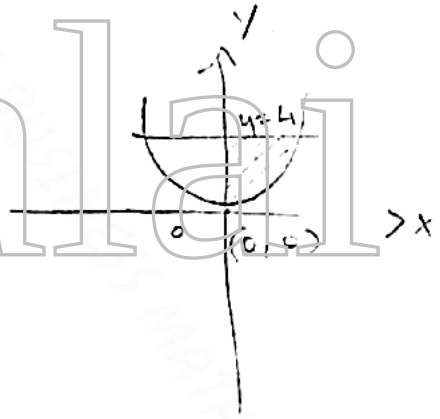
$$-\left[\left(\frac{1-2}{2}\right)-\left(\frac{4-4}{2}\right)\right]+\left[\left(\frac{9+6}{2}\right)-\left(\frac{1-2}{2}\right)\right]$$

$$-\left[\frac{-1}{2}-0\right]+\left[\frac{15}{2}+\frac{1}{2}\right]$$

$$\frac{1}{2}+\frac{15}{2}+\frac{1}{2}$$

$$= \frac{17}{2} \text{ Sq. units } //$$

6) $y = 4x^2,\ x = 0,\ y = 0,\ y = 4$



$$\text{Area} = \int_0^4 x\,dy$$

$y = 4x^2$

$x = \sqrt{y/4}$

$x = \sqrt{1/4}\sqrt{y}$

$x = 1/2\sqrt{y}$

$$= \int_0^4 1/2\sqrt{y}$$

$$= 1/2\left[\frac{y^{3/2}}{3/2}\right]_0^4$$

$$1/2\left[\frac{4^{3/2}}{3/2}-0\right]_0^4$$

$x^2 = 4$

$= \frac{1}{2} \times \frac{2}{2} \left[y^{3/2} \right]_0^4$

$= \frac{2}{3} \left[4^{3/2} - 0 \right]$

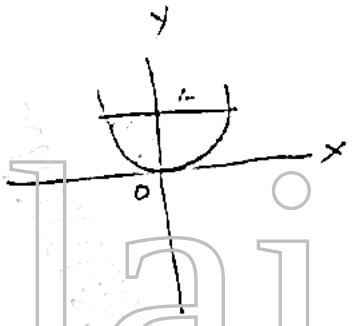
$= \frac{1}{3} \left[4^{3/2} \right]$

$= \frac{1}{3} (2)^{2 \times 3/2}$

$= \frac{1}{3} 2^3$

$= \frac{8}{3}$ Sq. units.

11)



$y = x^2$

$\text{Area} = 2 \int_0^4 x \, dy$

$\left[\because y = x^2 \right.$

$\left. x = \sqrt{y} \right]$

$= 2 \int_0^4 \sqrt{y} \, dy$

$= 2 \left[\frac{y^{3/2}}{3/2} \right]_0^4$

$2 \times \frac{2}{3} \left[y^{3/2} \right]_0^4$

$= \frac{4}{3} \left[4^{3/2} - 0 \right]$

$= \frac{4}{3} (2)^{2 \times 3/2}$

$= \frac{4}{3} \times 8$

$= \frac{32}{3}$

Area $= \frac{32}{3}$ Sq. units

S.MUTHU M.Sc., B.Ed
PGT MATHEMATICS
LITTLE FLOWER MHSS
MOULIVAKKAM
CHENNAI
600 125
Email: pearlkumar004@gmail.com
YouTube: MuthubusinessMaths

www.Padasalai.Net

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